Oide

Tacú leis an bhFoghlaim Ghairmiúil i measc Ceannairí Scoile agus Múinteoirí

Supporting the Professional Learning of School Leaders and Teachers

Online Webinar – Supporting the development of research skills in the Science classroom

April 2026

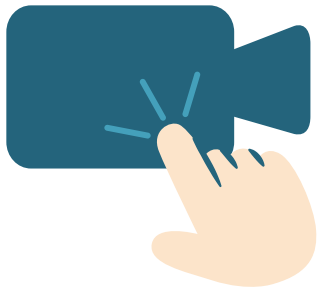
Key Messages

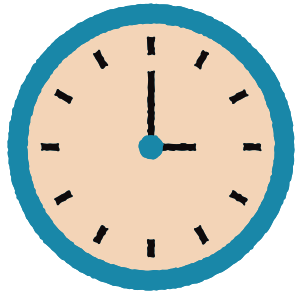
Strong investigation work is built on solid background research that genuinely deepens understanding, helps narrow the focus, and keeps the inquiry connected to reliable scientific ideas.

Moving from broad investigative interests toward clear, testable research questions and hypotheses is a pivotal step in high-quality inquiry enabled by purposeful questioning, structured dialogue, and thoughtful refinement of emerging ideas.

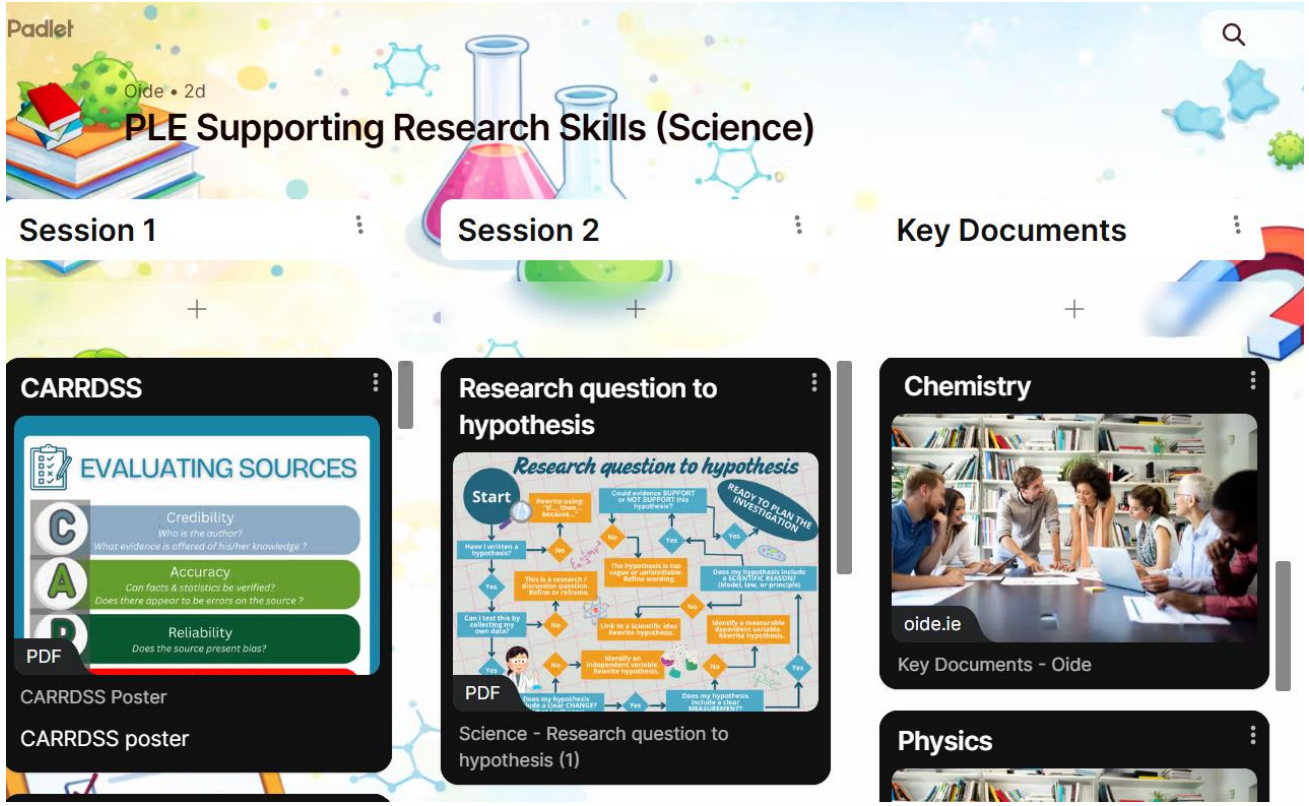
Effective and coherent reporting grows from clear structure, thoughtful planning, and meaningful reflection, enabling students to communicate their scientific thinking and investigative journey with clarity and authenticity.

Online Norms and Expectations





Padlet of Resources



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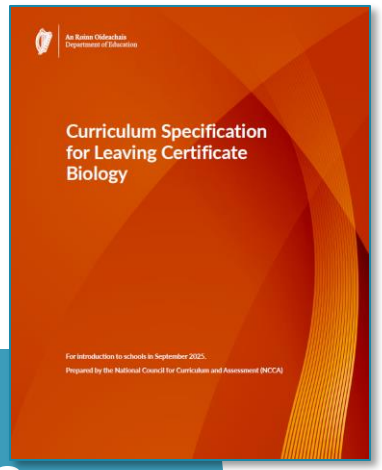
Key Skills for Junior Cycle



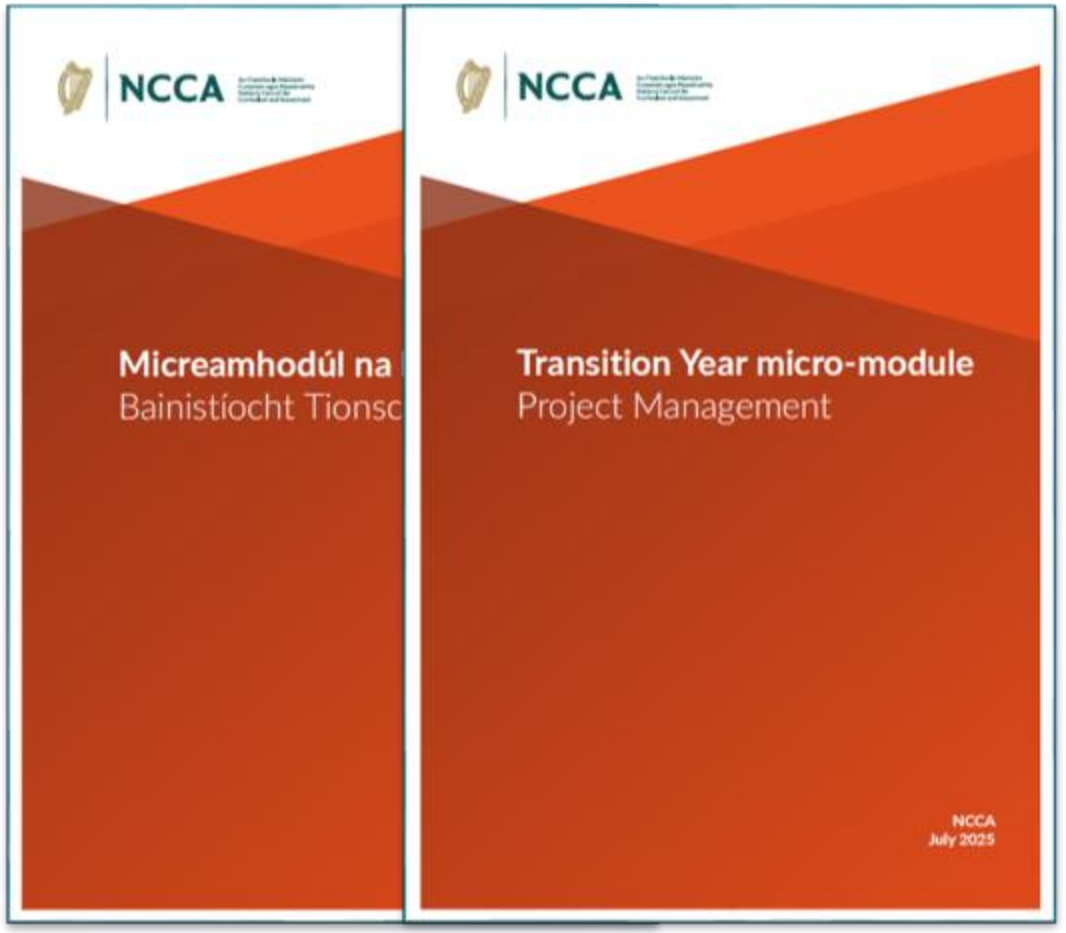
"All of the key skills developed across the curriculum during junior cycle support student learning in senior cycle."

(NCCA, p.5)

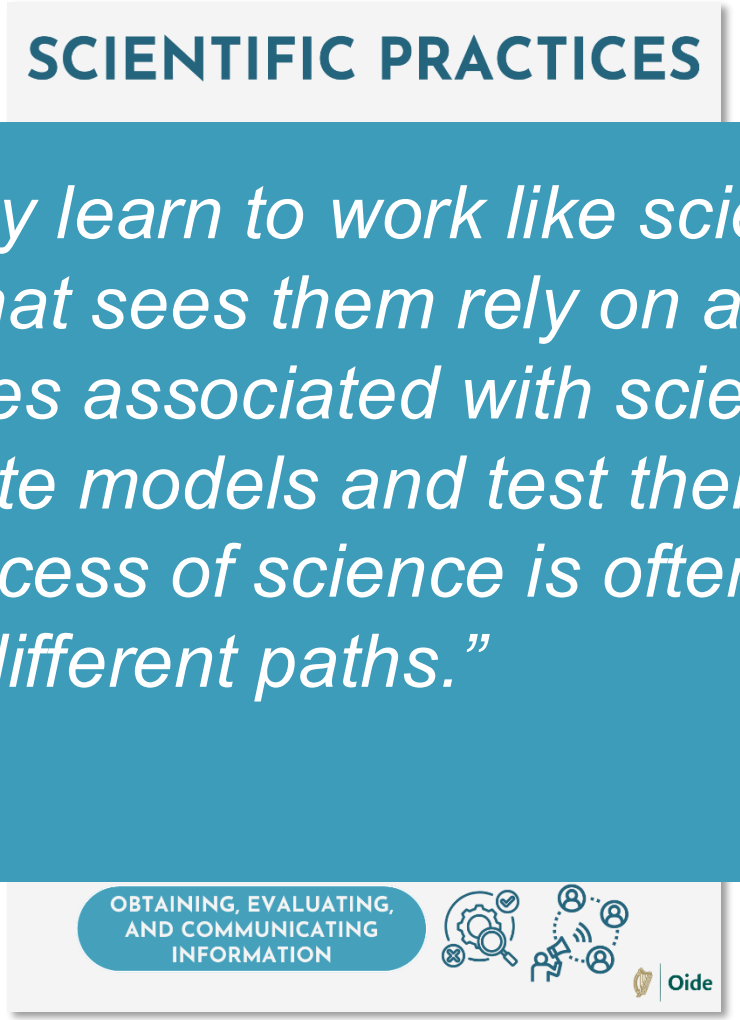
Project Management - TY Micro-module

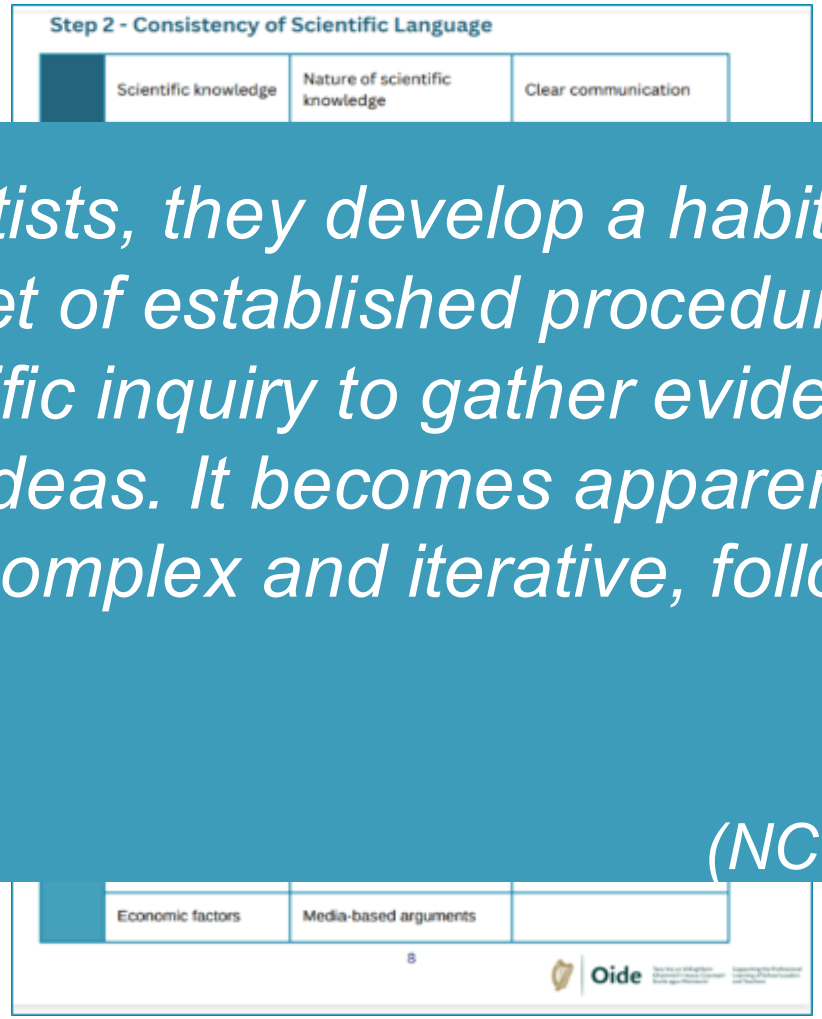
Project management can support

- planning
- pacing
- organisation
- time management



Unifying Strand – Working like a Scientist





"As they learn to work like scientists, they develop a habit of mind that sees them rely on a set of established procedures and practices associated with scientific inquiry to gather evidence, generate models and test their ideas. It becomes apparent that the process of science is often complex and iterative, following many different paths."

(NCCA, p.12)

Padlet of Resources

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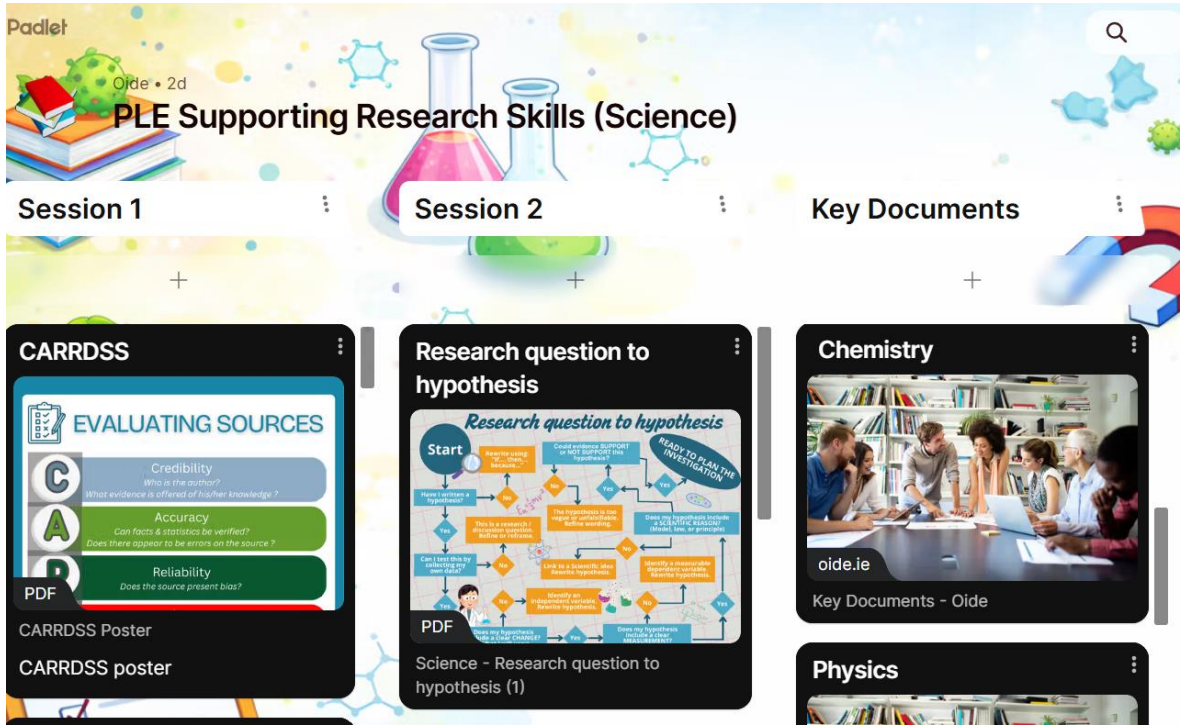

https://tinyurl.com/mvc3dbbt

Oide

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Supporting the Professional Learning of School Leaders and Teachers

Session 1

9:15 – 10:25

Supporting Students with Background Research and Referencing

Learning Intentions for Session 1

By the end of this session participants will have:

- gained practical strategies to support student research and referencing.
- identified common challenges and effective classroom supports.
- engaged with research as a learning outcome.

Why Background Research Matters

Background research

Background research supports:

- understanding the investigation focus
- informed experimental decisions
- scientific reasoning and justification
- reflection and evaluation

Time to Think

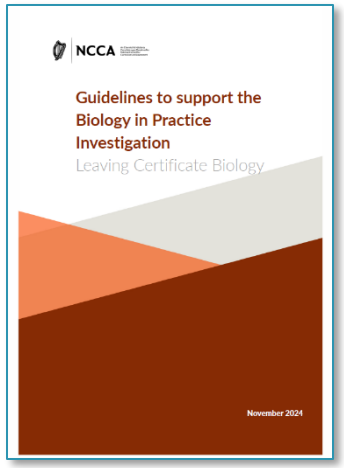
Where in your teaching so far have students had opportunities to develop research skills through engagement with learning experiences in your classroom?

The Biology in Practice Investigation - Research

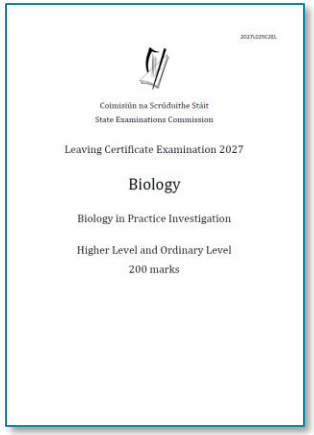
"Building on their learning to date, students will learn more about the nature of investigation through research and experimentation. Students should be empowered in realising that research and experimentation is more about engaging with and learning from the process, rather than focusing on the final product."

"It involves students completing a piece of work during the course and, in Year 2, submitting for marking to the State Examinations Commission (SEC), evidence of their ability to conduct scientific research on a particular issue and to use appropriate primary data to investigate aspects of that issue".

"They (students) gather, process and evaluate information from secondary sources. The knowledge gained from this phase of the investigation may help to inform their experimental work".

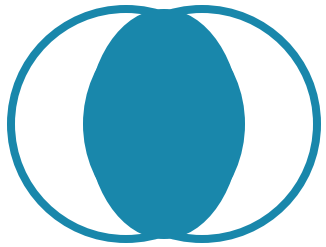


(NCCA, 2024, p. 2)

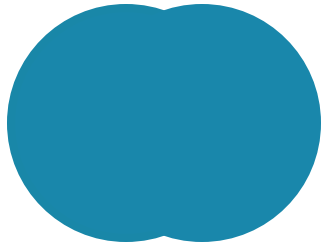


Online Research: Effective Search Strategies

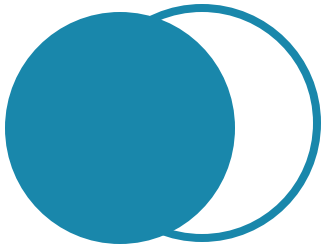
Common Boolean Operators



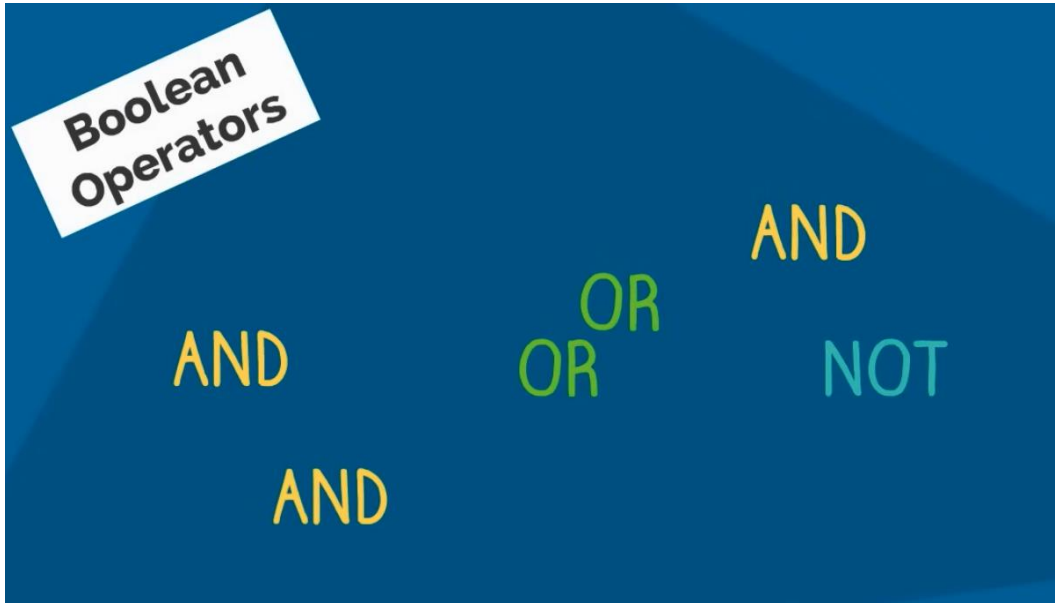
AND – Narrows the search



OR – Broadens the search



NOT – Excludes unwanted results



Search Vs Research

Search

- Finding information
- Often quick and surface-level
- Focused on answers

Research

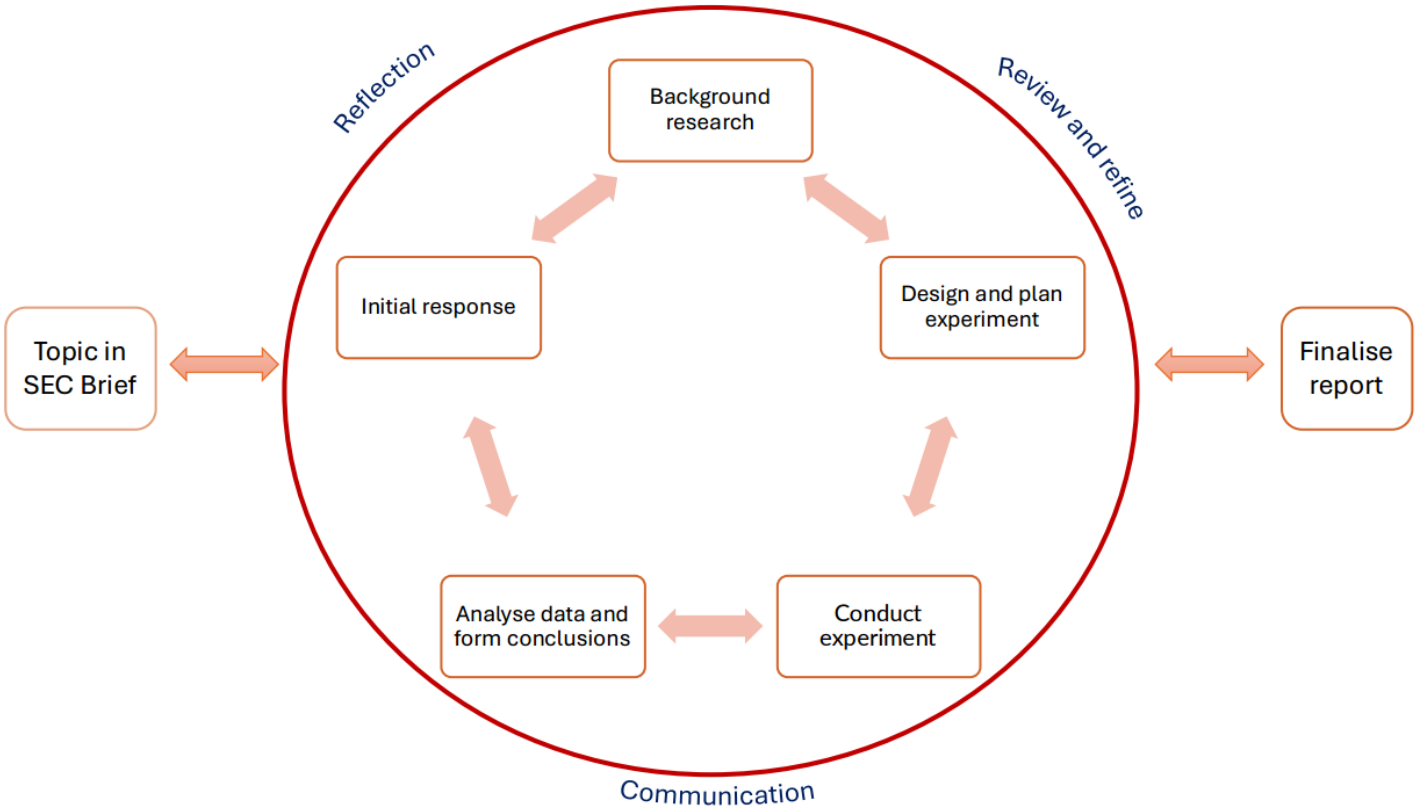
- Engaging with information
- Involves evaluation and judgement
- Asking who, why, when and how reliable
- Focused on understanding and decision-making

Search Vs Research

Search Vs Research

Research as a Process

Aligning Process to Practice

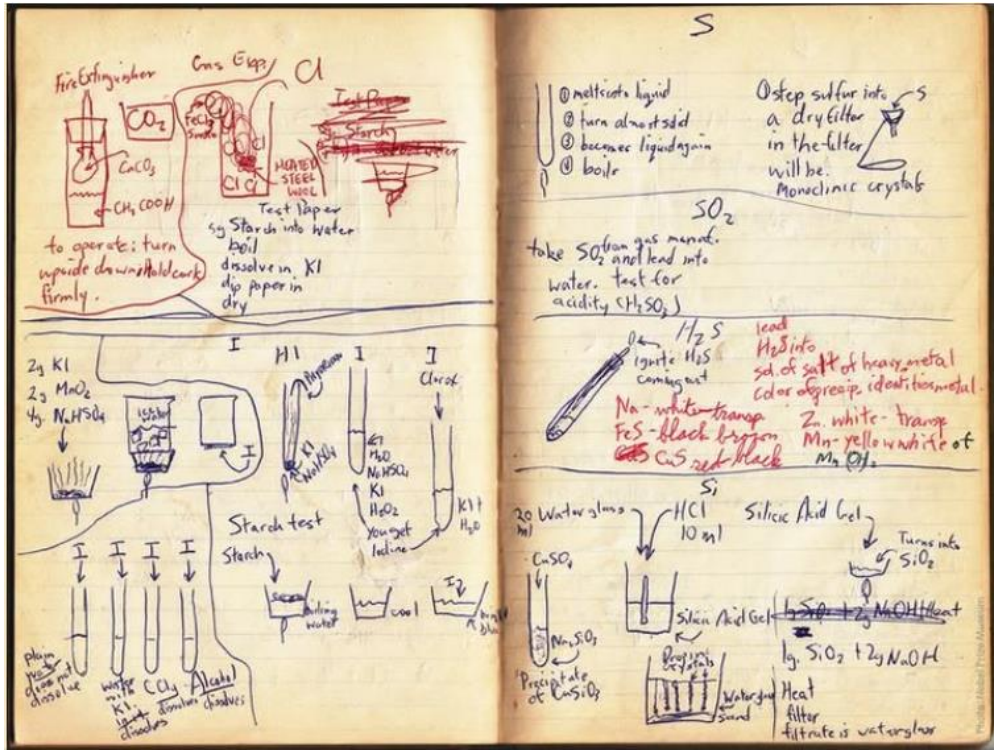


NCCA, Guidelines

Recording Research: Investigative Logs as Learning Tools

Investigative logs can capture:

- sources consulted
- key ideas or findings
- questions raised
- decisions influenced

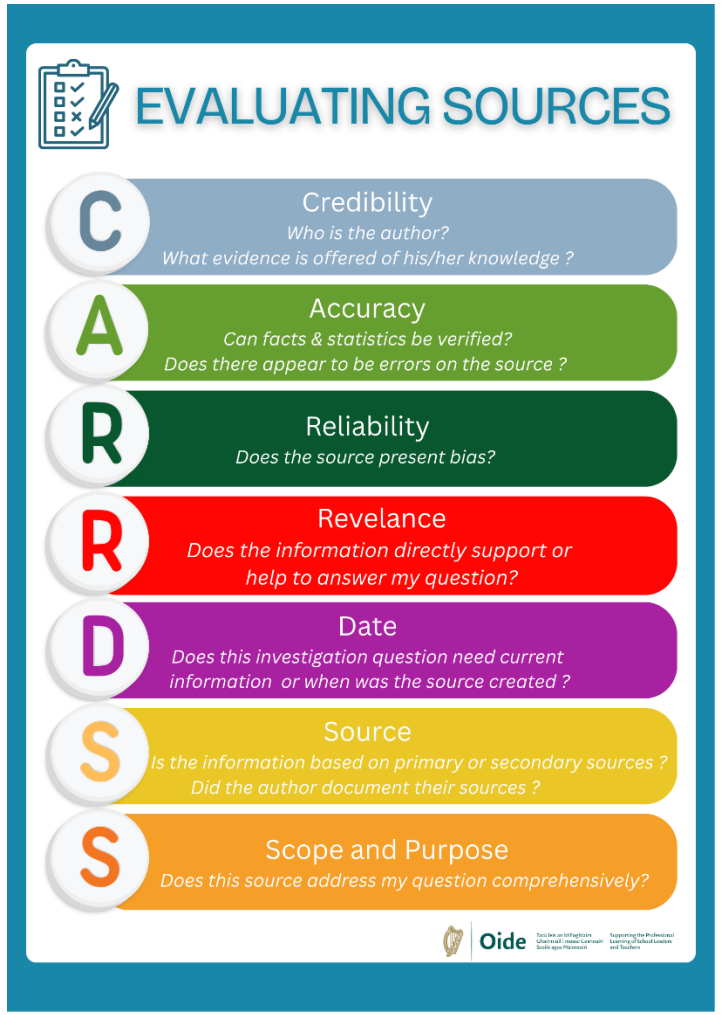


Childhood notebook of Roger Tsien, 2008 Chemistry laureate

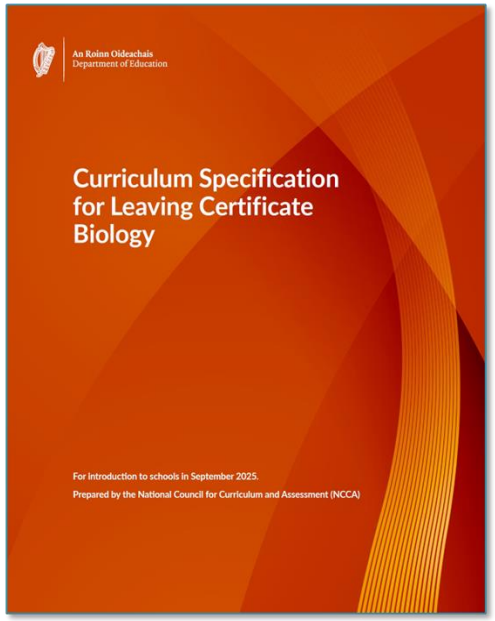
Evaluating Sources - CARRDSS

Students can be supported to ask:

- who is the author or source of this information?
- what was the purpose for creating it?
- how current and relevant is it?
- is it supported by reliable, independent sources?



Research in the Learning Outcomes



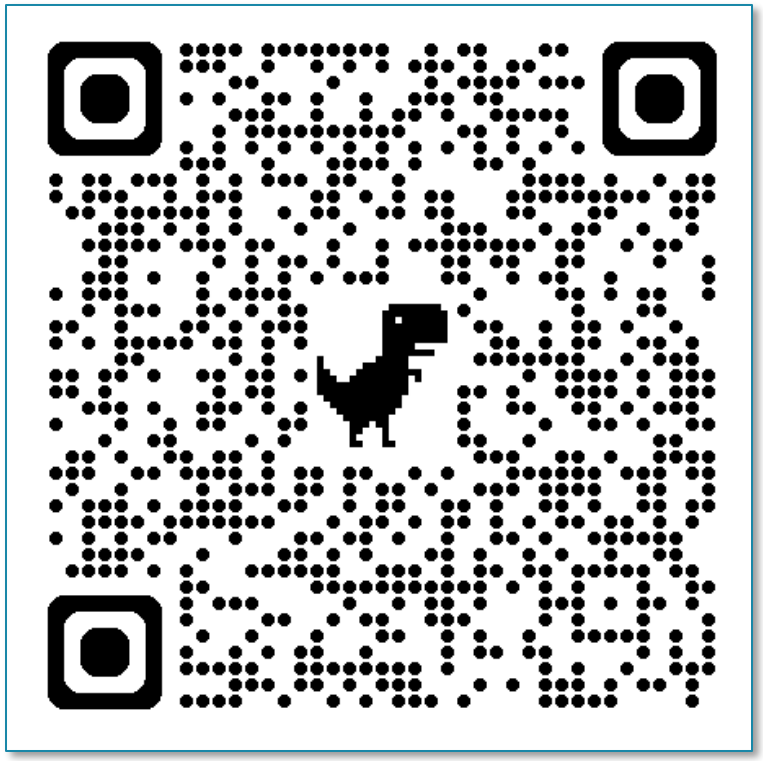
Students learn about	Students should be able to
1.4. Information of life – genetic inheritance	
genetic mechanisms – inheritance through passing on of DNA	3. compare genetic and epigenetic mechanisms, **research one example of epigenetic inheritance in nature**

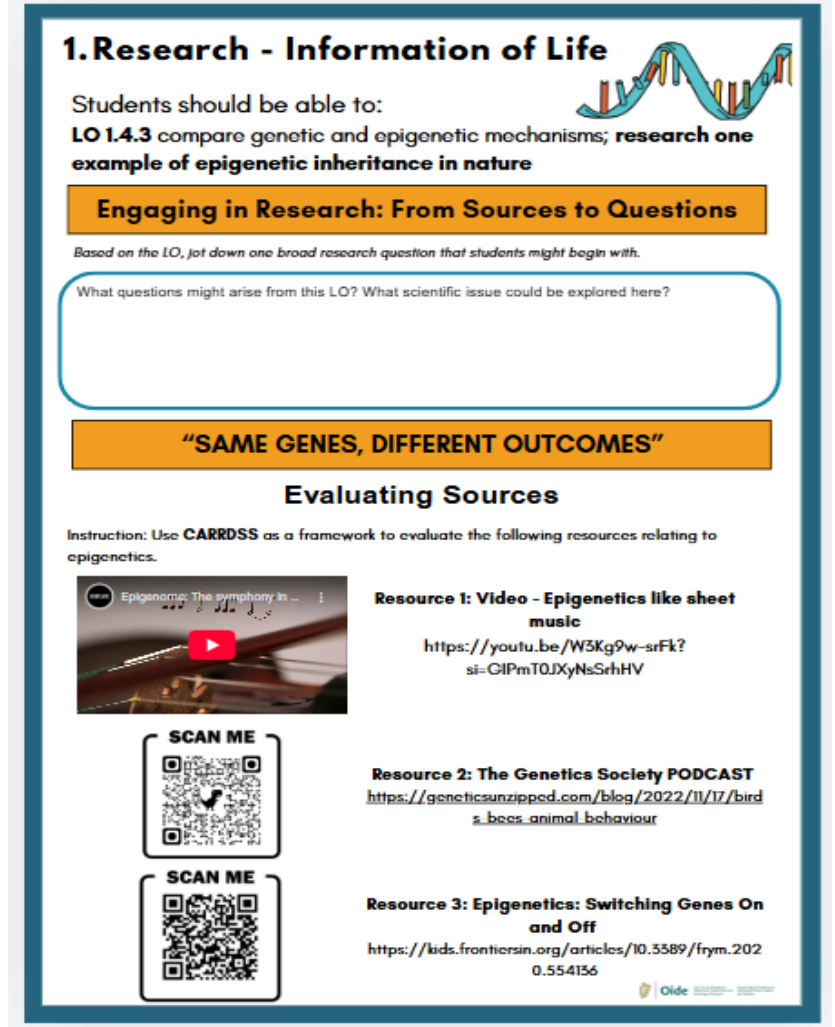
Action Verbs Specification p. 47/48

L.O. 1.4.3

Research	inquire specifically, using involved and critical investigation

Research in the Learning Outcomes





1. Research - Information of Life

Students should be able to:

LO 1.4.3 compare genetic and epigenetic mechanisms; **research one example of epigenetic inheritance in nature**

Engaging in Research: From Sources to Questions

Based on the LO, jot down one broad research question that students might begin with.

What questions might arise from this LO? What scientific issue could be explored here?

"SAME GENES, DIFFERENT OUTCOMES"

Evaluating Sources

Instruction: Use **CARRDSS** as a framework to evaluate the following resources relating to epigenetics.

Resource 1: Video - Epigenetics like sheet music
https://youtu.be/W3Kg9w-srFk?si=GIPmT0JXyNsSrhHV

SCAN ME

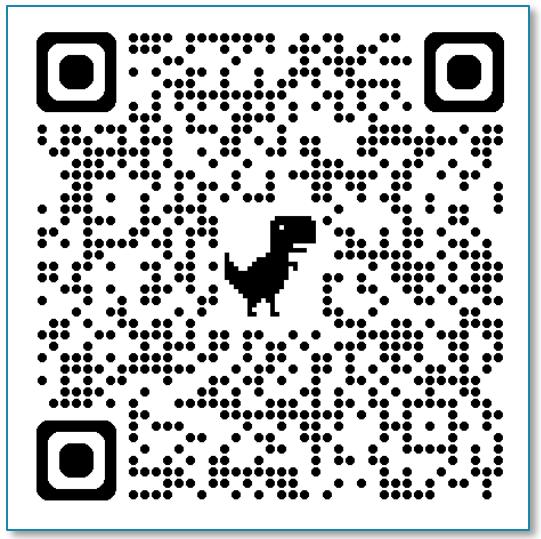
Resource 2: The Genetics Society PODCAST
https://geneticsunzipped.com/blog/2022/11/17/birds_bees_animal_behaviour

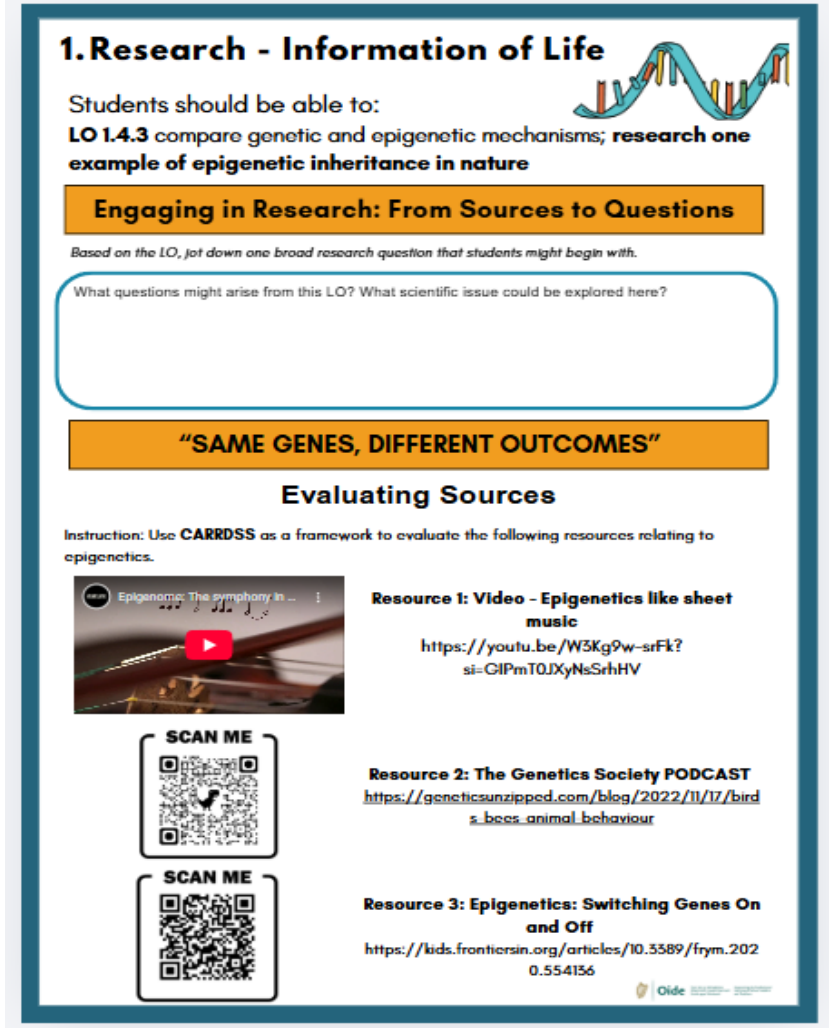
SCAN ME

Resource 3: Epigenetics: Switching Genes On and Off
https://kids.frontiersin.org/articles/10.3389/frym.2020.554156

Oide

Research in the Learning Outcomes





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SCAN ME

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Oide

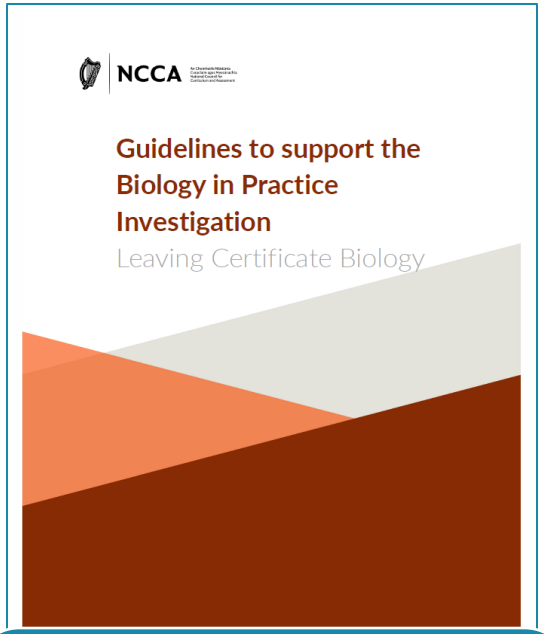
Time to Think

What other areas of teaching and learning could you plan to use this activity to support your students research skill development within your classroom?

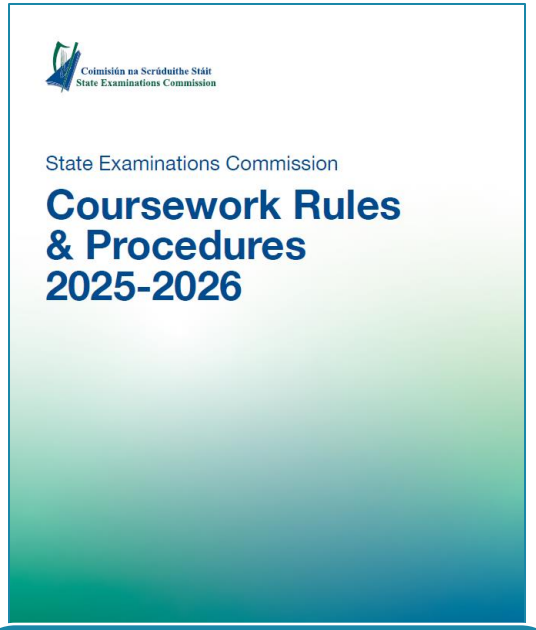
Referencing: Purpose Before Format

Referencing supports:

- academic integrity
- transparency of thinking
- traceability of ideas



Appendix 1 – Guidelines to Support Referencing
p. 15-17

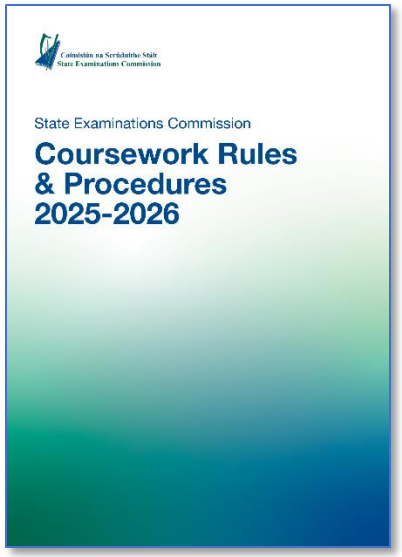


Appendix 1 – Guidelines for referencing in SEC Coursework
p. 32

Rules for the Use of AI in SEC Examination Coursework

"Where Artificial Intelligence (AI) tools (including software and applications) are used in State examination coursework, it must be conducted in a responsible and ethical manner. This is essential to maintain academic integrity and ensure that candidates' work reflects their own understanding and efforts"

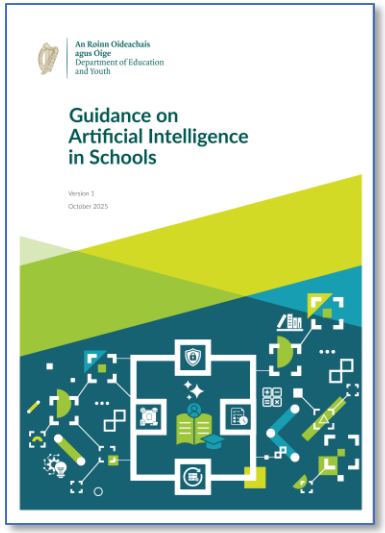
(State Examinations Commission, p. 33, 2025)



Guidance on Artificial Intelligence in Schools

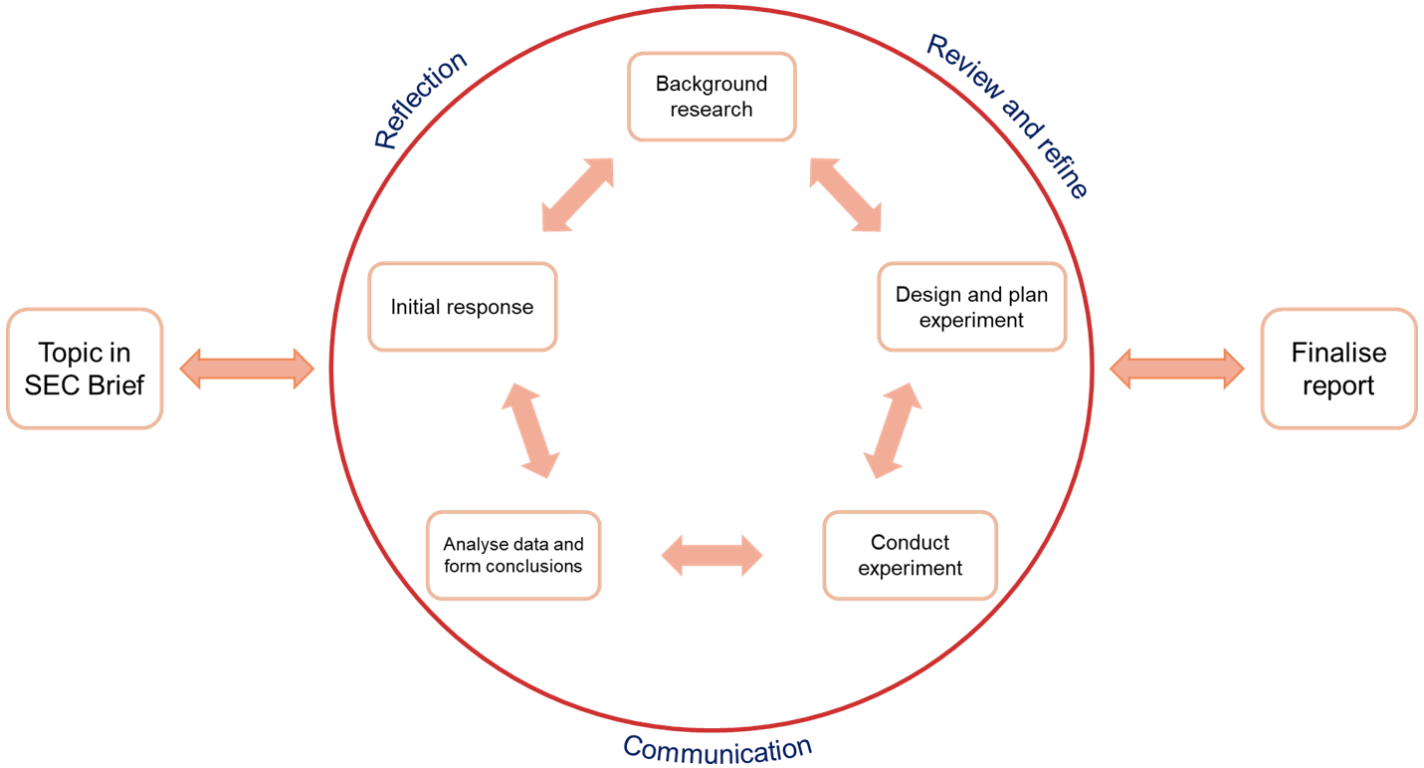
"The ethical considerations when using AI and data in education include ensuring that the AI systems used are reliable, fair, safe, and trustworthy and that the management of educational data is secure, protects the privacy of individuals, and is used for the common good"

(Department of Education and Youth, p. 12, 2025)



What is Plagiarism?

Research Across the Investigation Process



NCCA, Guidelines

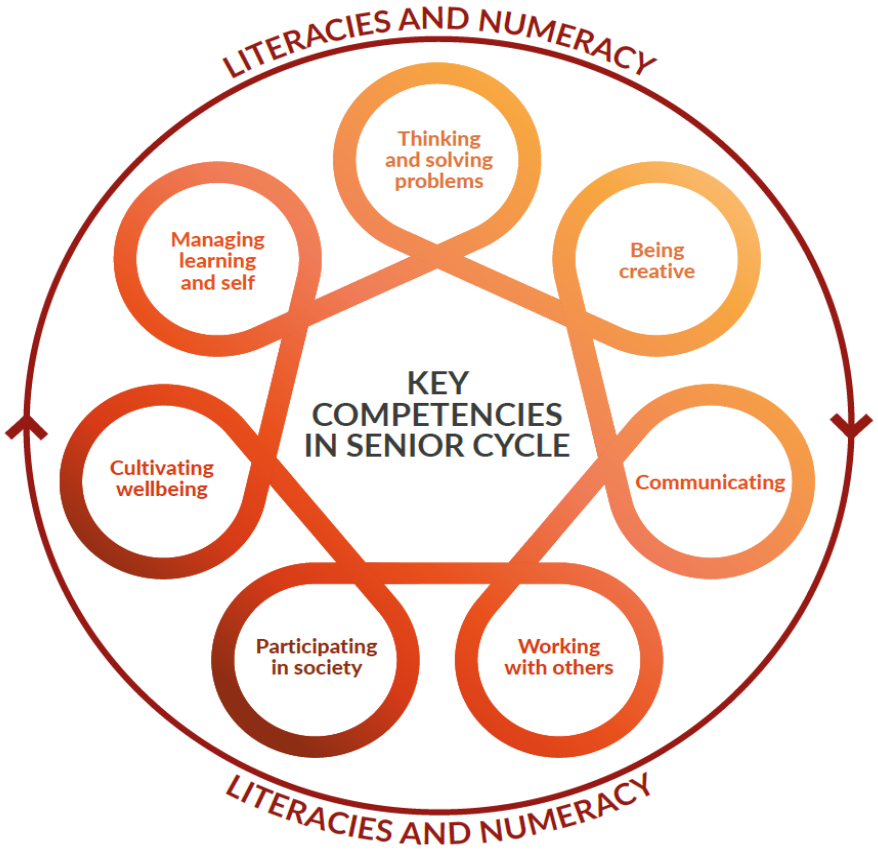
Research supports

- question formation
- hypothesis development
- experimental decisions
- reflection and evaluation

Reflection as Evidence of Learning

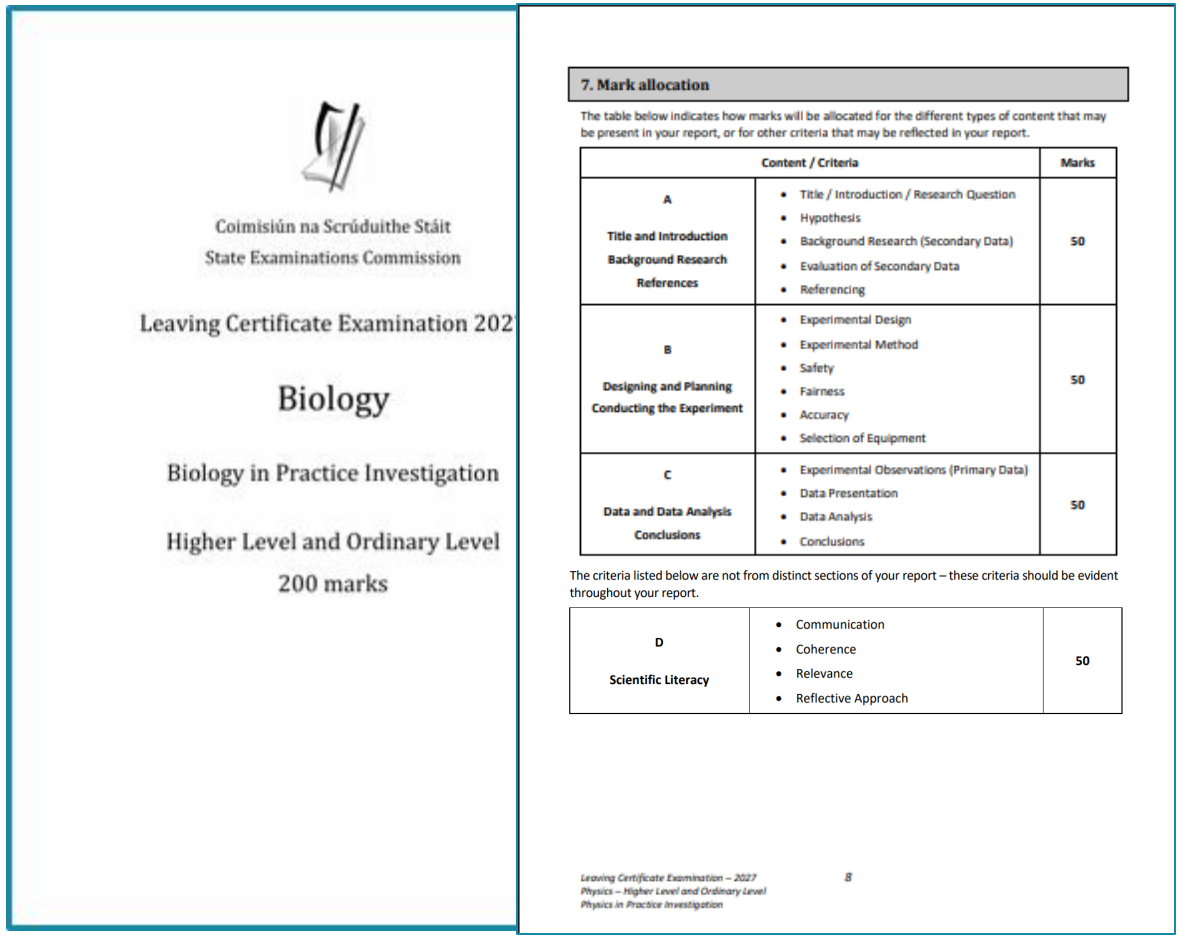
Reflection supports students to:

- evaluate their decisions and actions
- make sense of evidence and outcomes
- identify limitations and improvements
- articulate what they have learned



> ***"We learn from reflecting on experience"***
>
> John Dewey

Thinking and Decision-Making Throughout the Investigation



Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate Examination 202

Biology

Biology in Practice Investigation

Higher Level and Ordinary Level

200 marks

7. Mark allocation

The table below indicates how marks will be allocated for the different types of content that may be present in your report, or for other criteria that may be reflected in your report.

Content / Criteria		Marks
A **Title and Introduction** **Background Research** **References**	• Title / Introduction / Research Question • Hypothesis • Background Research (Secondary Data) • Evaluation of Secondary Data • Referencing	50
B **Designing and Planning** **Conducting the Experiment**	• Experimental Design • Experimental Method • Safety • Fairness • Accuracy • Selection of Equipment	50
C **Data and Data Analysis** **Conclusions**	• Experimental Observations (Primary Data) • Data Presentation • Data Analysis • Conclusions	50

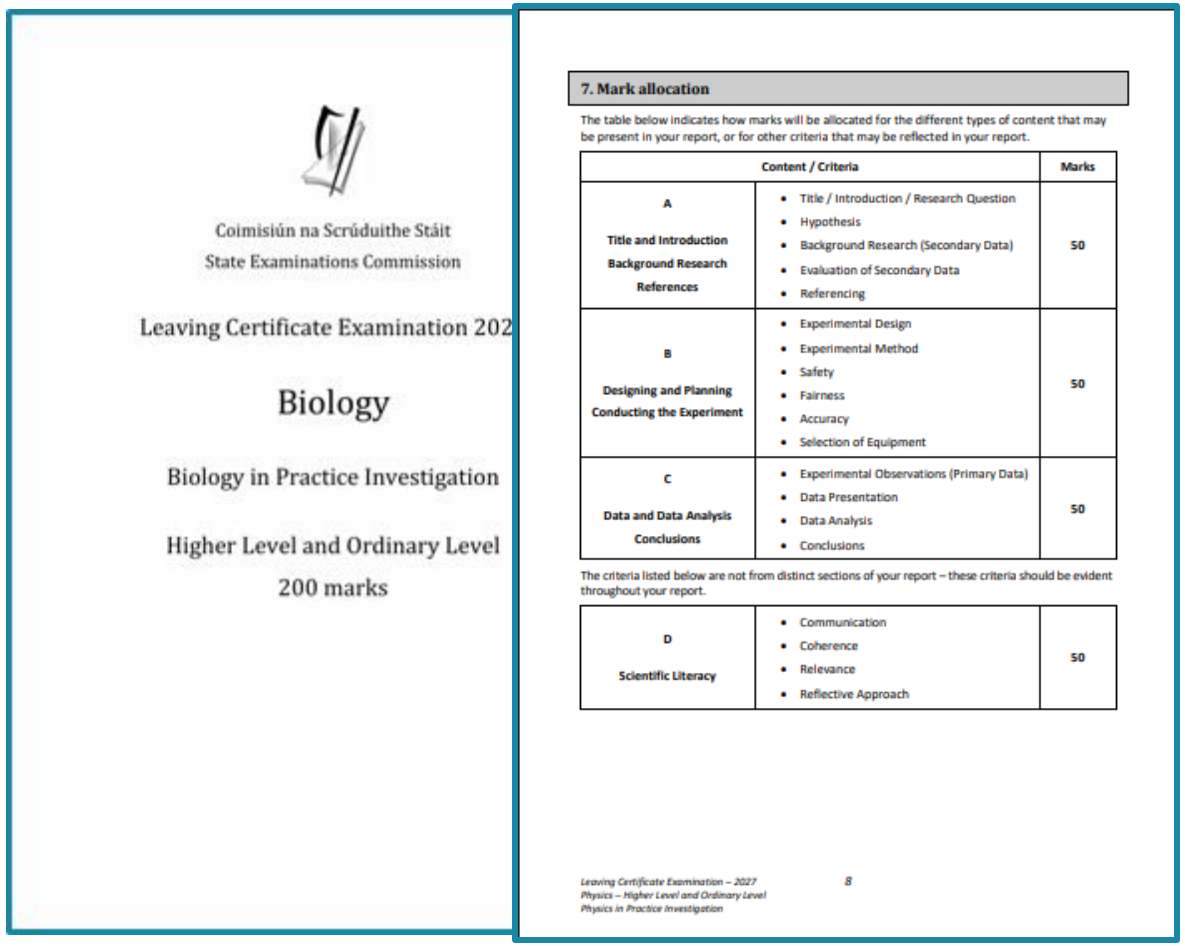
The criteria listed below are not from distinct sections of your report – these criteria should be evident throughout your report.

D **Scientific Literacy**	• Communication • Coherence • Relevance • Reflective Approach	50

Leaving Certificate Examination – 2027
Physics – Higher Level and Ordinary Level
Physics in Practice Investigation

8

Thinking and Decision-Making Throughout the Investigation



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Leaving Certificate Examination – 2027
Physics – Higher Level and Ordinary Level
Physics in Practice Investigation

8

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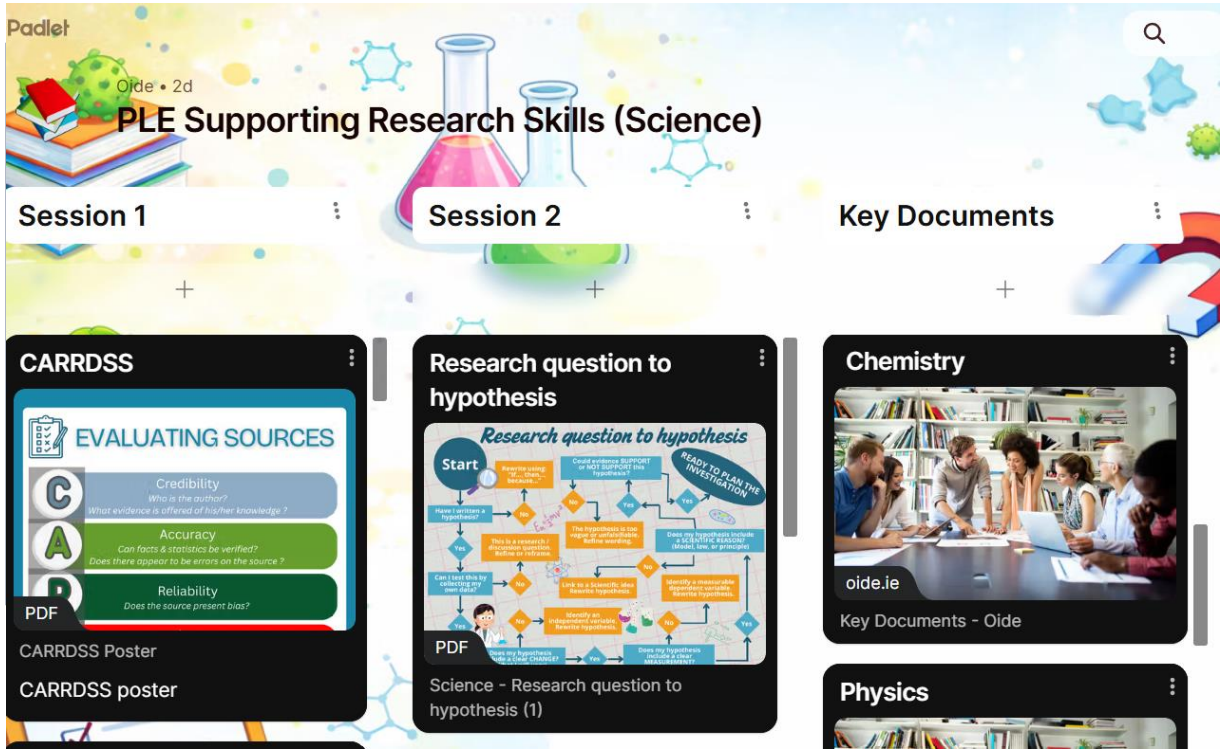
D **Scientific Literacy**	• Communication • Coherence • Relevance • Reflective Approach	**50**

Time to Think

- How can I support and empower my students' day to day to further progress their research skills?

- What is the next Learning Outcome that you will use to support the progression of these skills?

Padlet of Resources



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Supporting the Professional Learning of School Leaders and Teachers

Stretch break

PLE	Date	Time
Developing Students' Skills for an Extended Experimental Investigation: Moving Towards Classroom-Based Assessment 1	25th March	19:00 - 20:15
Developing Students' Research Skills for a Science in Society Investigation: Moving towards Classroom-Based Assessment 2	22nd April	19:00 - 20:15

To register a place on this event please click:
https://oide.ie/apply-book-now/teachers/

For further details email sciences@oide.ie

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Supporting the Professional Learning of School Leaders and Teachers

Session 2

10:25 – 11.15

Supporting Students to Form Research Questions and Hypotheses

Learning Intentions for Session 2

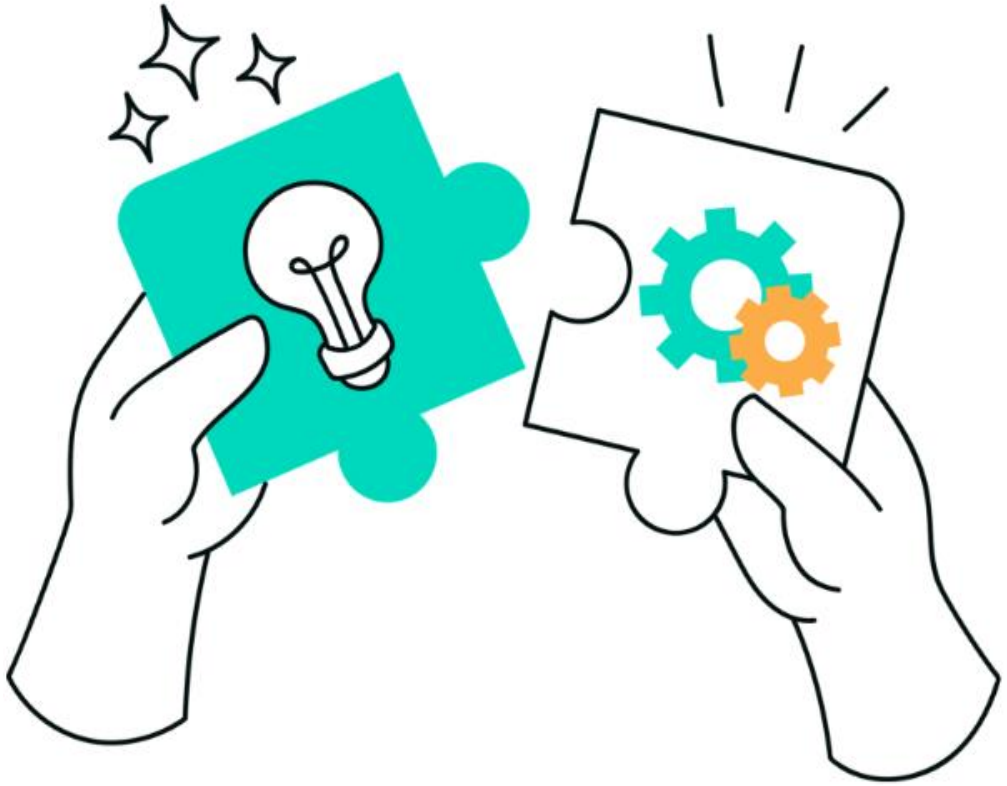
By the end of this session participants will have:

- engaged with strategies to support students in developing research questions and forming testable hypotheses.
- reflected on promoting authenticity and maintaining the integrity of the assessment process.

From Curiosity to Focus

Students often begin with:

- broad interests
- everyday observations
- real-world phenomena

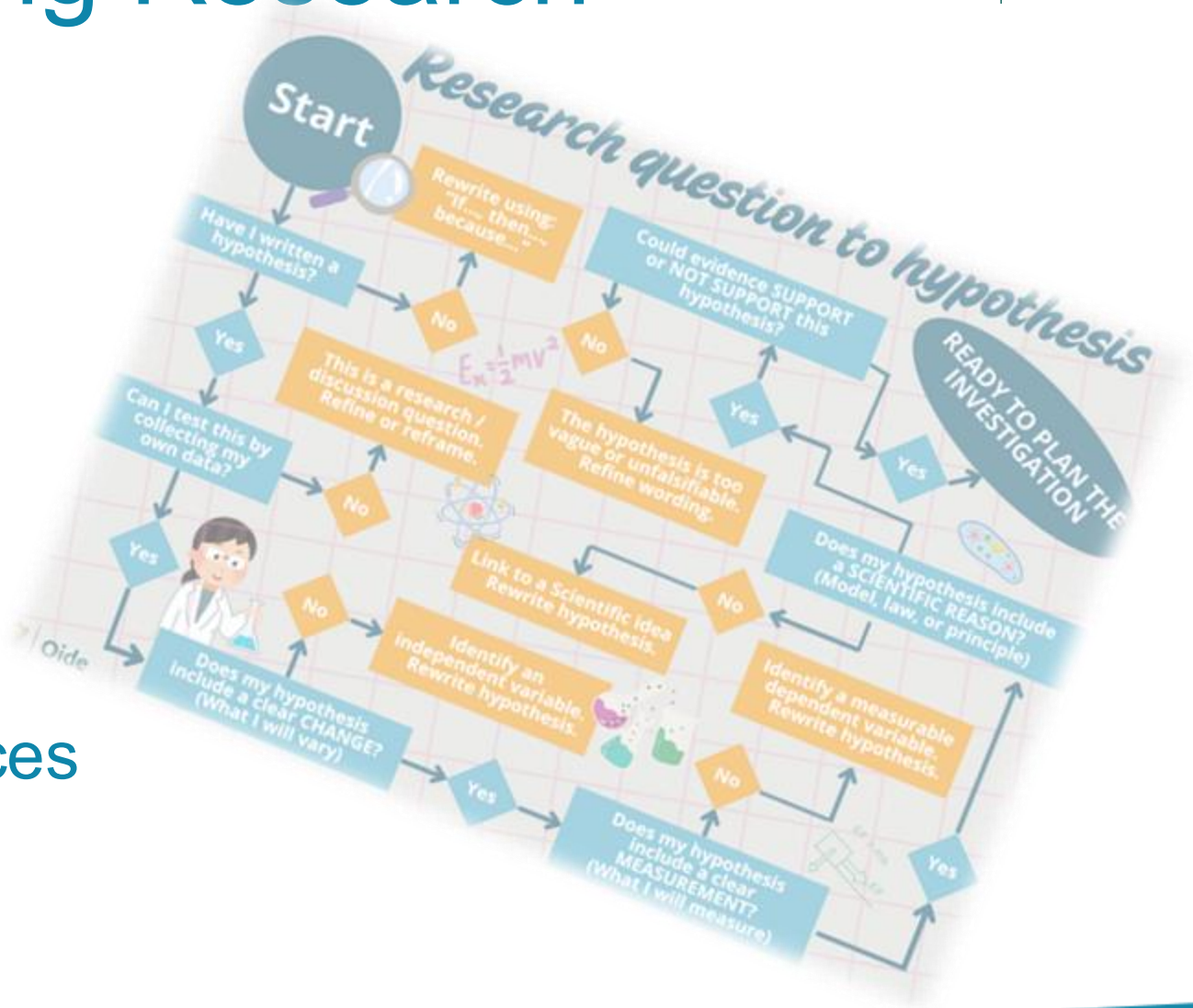


They need support to refine their focus.

What Makes a Strong Research Question?

A strong research question is:

- clear
- focused
- investigable
- aligned with available resources



Distinguishing Questions and Hypotheses

Research questions

- Ask what or how

Hypotheses

- Make a testable prediction
- Are informed by research

Research question to hypothesis

Start

Have I written a hypothesis?

No

Rewrite using: "If..., then..., because..."

Yes

Can I test this by collecting my own data?

No

This is a research / discussion question. Refine or reframe.

Yes

Does my hypothesis include a clear CHANGE? (What I will vary)

No

Identify an independent variable. Rewrite hypothesis.

Yes

Does my hypothesis include a clear MEASUREMENT? (What I will measure)

No

Identify a measurable dependent variable. Rewrite hypothesis.

Yes

Does my hypothesis include a SCIENTIFIC REASON? (Model, law, or principle)

No

Link to a Scientific idea. Rewrite hypothesis.

Yes

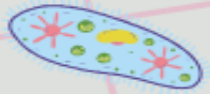
Could evidence SUPPORT or NOT SUPPORT this hypothesis?

No

The hypothesis is too vague or unfalsifiable. Refine wording.

Yes

READY TO PLAN THE INVESTIGATION



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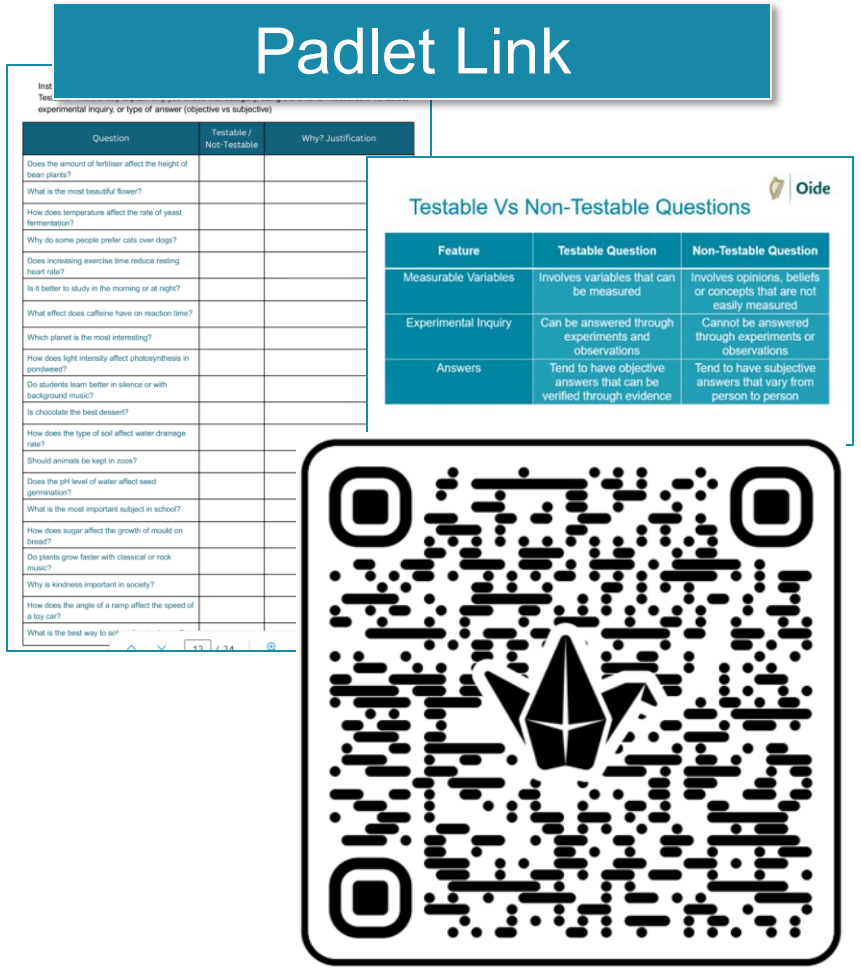
Sorting activity: Testable vs Non-Testable

Wordwall Interactive Game

wordwall.net/resource/108523910

Padlet Link



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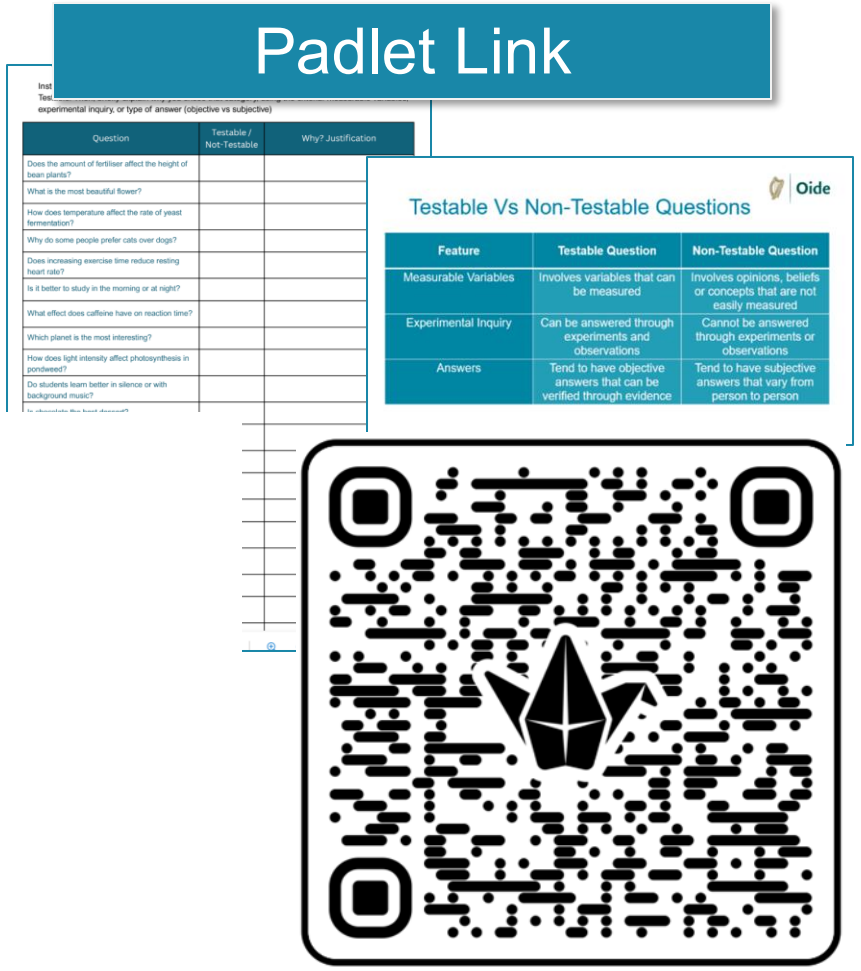


Time to Think

1. What challenges do students typically encounter when they begin refining their research questions or hypotheses?

2. What learning outcomes offer opportunities to students to develop and refine their research questions and hypotheses?

Supporting Hypothesis Development

Teachers can support students by:

- asking thought provoking questions
- encouraging justification
- highlighting assumptions
- linking to prior learning

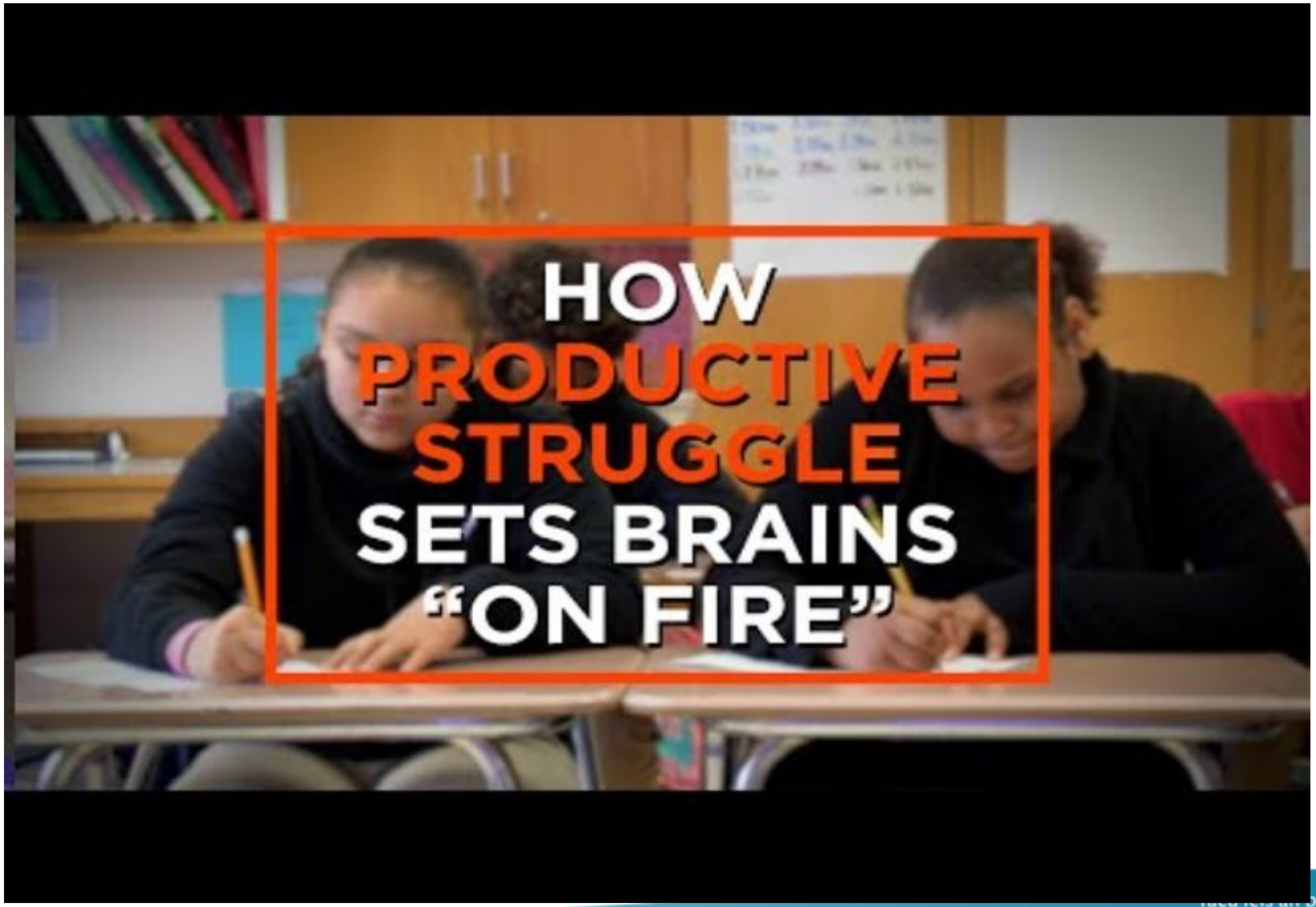
Effective questioning is part of the process

Feasibility and Manageability

Key considerations include

- Time
- Safety about student activity
- Equipment
- Accuracy and reliability

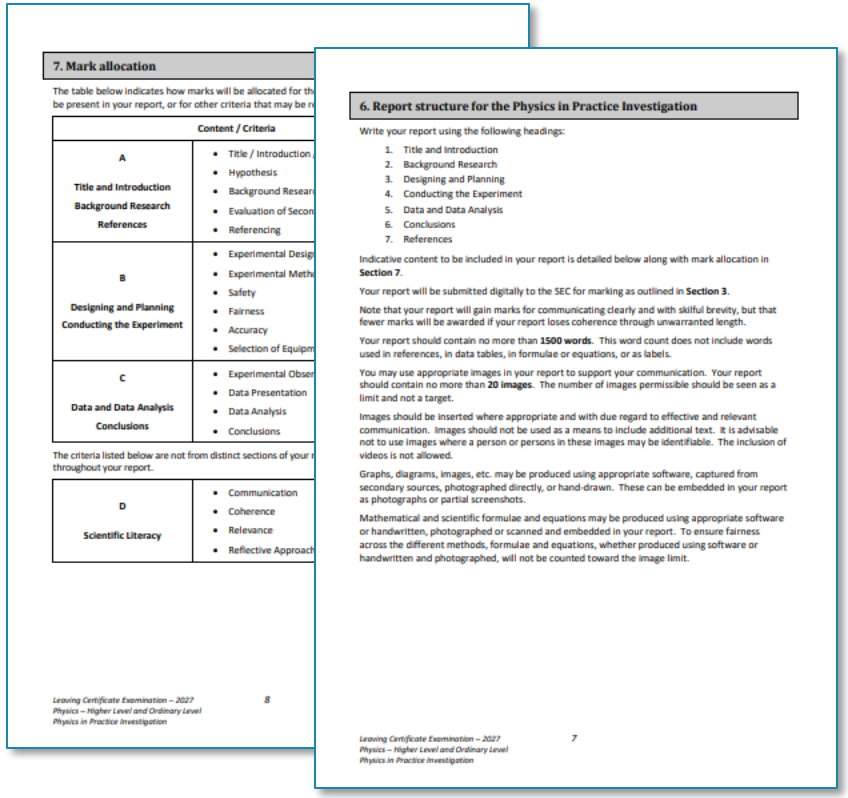
Linking to the Wider Investigation Process



The Report as a Coherent Communication Tool

The investigative report:

- communicates the investigative process
- explains decisions and reasoning
- presents evidence clearly
- tells a coherent, connected story



7. Mark allocation

The table below indicates how marks will be allocated for th
be present in your report, or for other criteria that may be r

	Content / Criteria
A Title and Introduction Background Research References	• Title / Introduction • Hypothesis • Background Researc • Evaluation of Secon • Referencing
B Designing and Planning Conducting the Experiment	• Experimental Desig • Experimental Meth • Safety • Fairness • Accuracy • Selection of Equipm
C Data and Data Analysis Conclusions	• Experimental Obser • Data Presentation • Data Analysis • Conclusions

The criteria listed below are not from distinct sections of your r
throughout your report.

D Scientific Literacy	• Communication • Coherence • Relevance • Reflective Approach

Leaving Certificate Examination – 2027
Physics – Higher Level and Ordinary Level
Physics in Practice Investigation
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6. Report structure for the Physics in Practice Investigation

Write your report using the following headings:

1. Title and Introduction
2. Background Research
3. Designing and Planning
4. Conducting the Experiment
5. Data and Data Analysis
6. Conclusions
7. References

Indicative content to be included in your report is detailed below along with mark allocation in **Section 7**.

Your report will be submitted digitally to the SEC for marking as outlined in **Section 3**.

Note that your report will gain marks for communicating clearly and with skilful brevity, but that fewer marks will be awarded if your report loses coherence through unwarranted length.

Your report should contain no more than **1500 words**. This word count does not include words used in references, in data tables, in formulae or equations, or as labels.

You may use appropriate images in your report to support your communication. Your report should contain no more than **20 images**. The number of images permissible should be seen as a limit and not a target.

Images should be inserted where appropriate and with due regard to effective and relevant communication. Images should not be used as a means to include additional text. It is advisable not to use images where a person or persons in these images may be identifiable. The inclusion of videos is not allowed.

Graphs, diagrams, images, etc. may be produced using appropriate software, captured from secondary sources, photographed directly, or hand-drawn. These can be embedded in your report as photographs or partial screenshots.

Mathematical and scientific formulae and equations may be produced using appropriate software or handwritten, photographed or scanned and embedded in your report. To ensure fairness across the different methods, formulae and equations, whether produced using software or handwritten and photographed, will not be counted toward the image limit.

Leaving Certificate Examination – 2027
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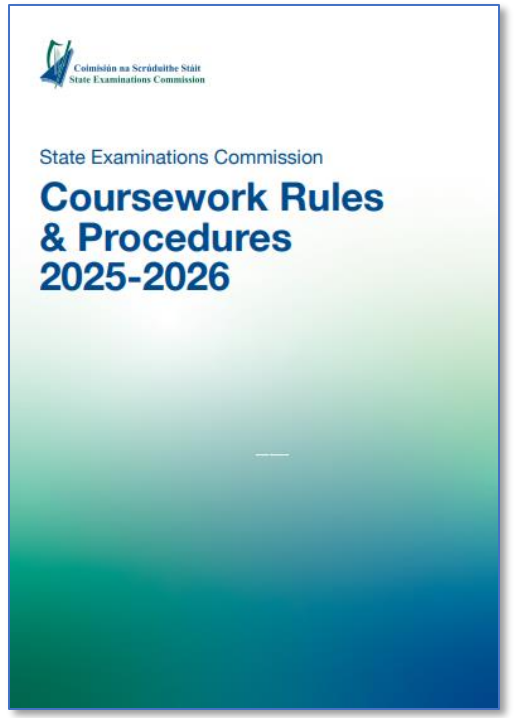
Investigation Brief 2027, p. 7/8

Maintaining Authenticity

If teachers have supported students to develop their research skills and scientific habits, this will naturally align with the coursework rules & procedures and thus maintaining authenticity of the students work

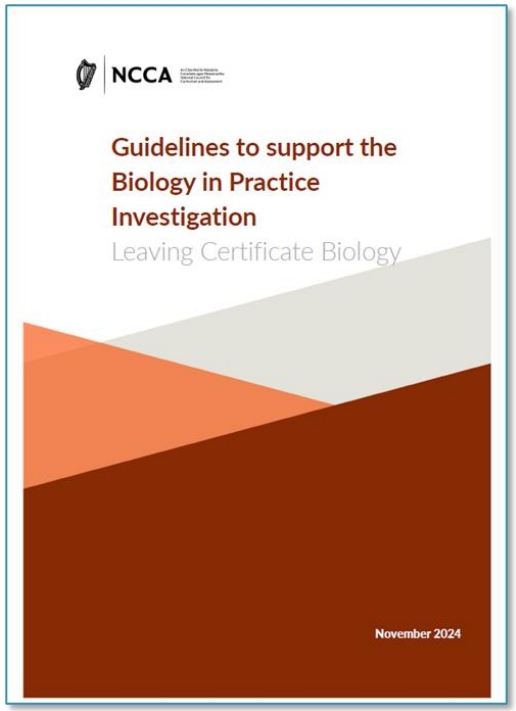


Role and responsibility of the class teacher, Coursework Rules & Procedures, p. 13/14

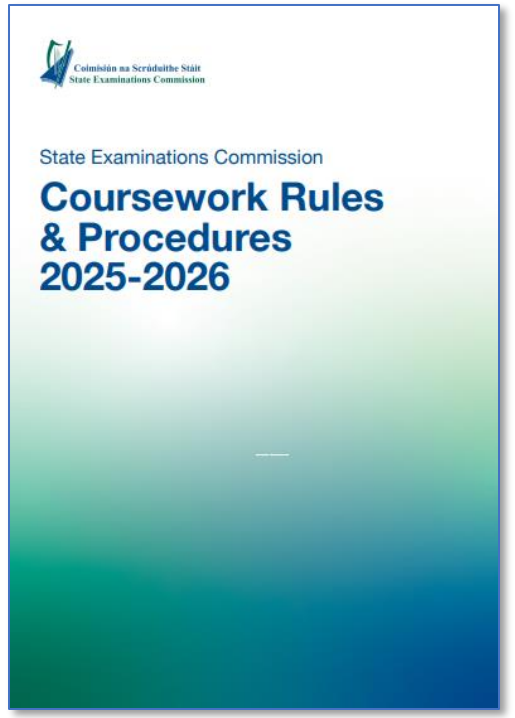
Maintaining Authenticity

Teacher support should:

- **prepare**, not react
- **guide**, not direct
- **question**, not correct
- **support independence**
- maintain **integrity**



The Role of the Teacher NCCA Guidelines p. 12/13



Role and responsibility of the class teacher, Coursework Rules & Procedures, p. 13/14

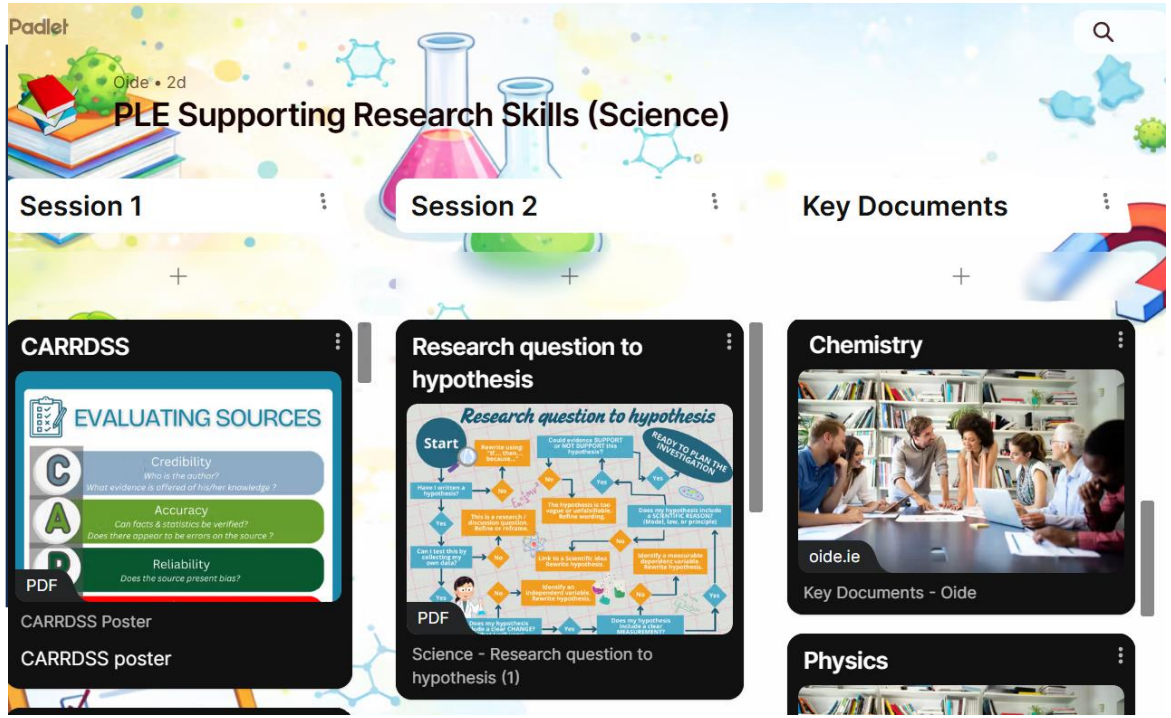
Closing Reflection

What skills, practices or competencies do your students need more support with?

What strategy/strategies, from today's webinar or your prior practice, would you revisit to support students to develop their skills, practices or competencies?

Padlet of Resources

SCAN ME



Aiseolas

SCAN ME

https://tinyurl.com/bdfkzswc

Thank you for taking the time to complete this evaluation

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