



An Roinn Oideachais
agus Scileanna
Department of
Education and Skills

Agricultural Science National Workshop 4

LEAVING CERTIFICATE AGRICULTURAL SCIENCE



Helen Van Eesbeck

Chris Davies

Ronan Dowling

Email agscience@pdst.ie

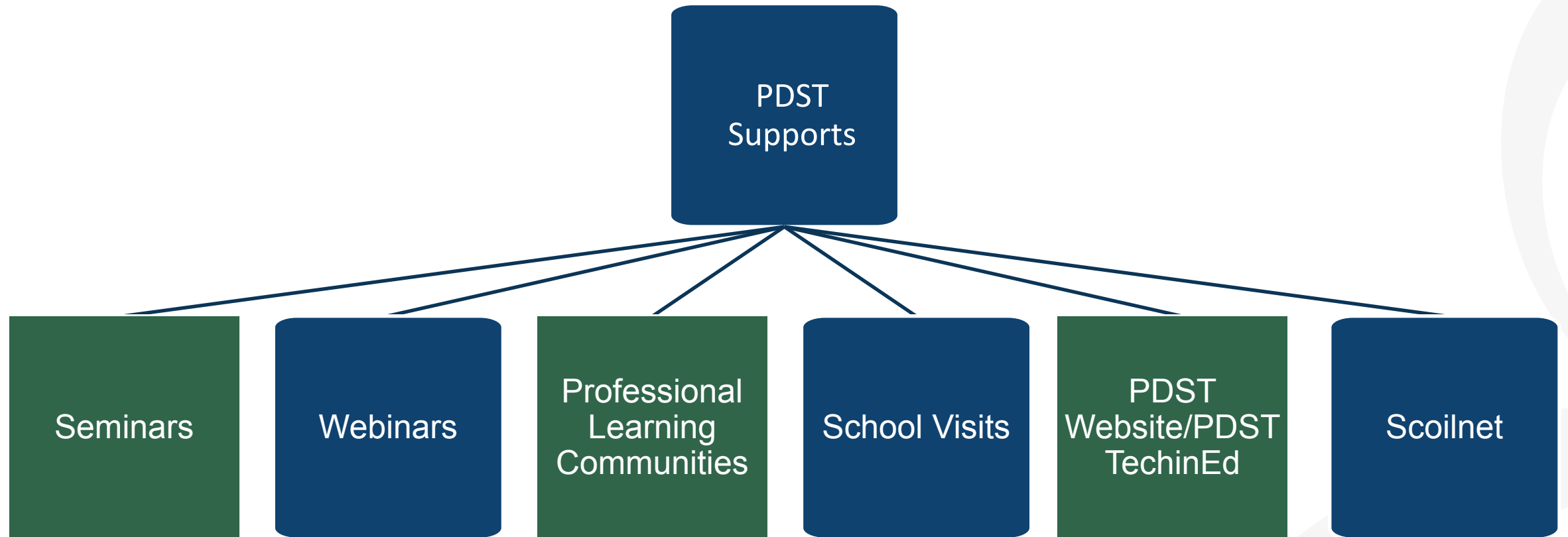
Expectations for Online CPD



The PDST does not give permission for this CPD event to be recorded.

- The meeting link should not be shared outside of agreed attendees.
- Timekeeping.
- Bring relevant resources.
- Respect all participant contributions.
- Engage in professional dialogue and interaction.
- Respect the confidentiality of all participants and issues raised.
- Mute your microphone when you are not talking.
- Raise the pen or hand to indicate to the facilitator that you wish to contribute.
- **All curriculum related queries are to be directed to info@ncca.ie**
- **All examination related queries are directed to the State Examinations Commission.**

PDST Supports



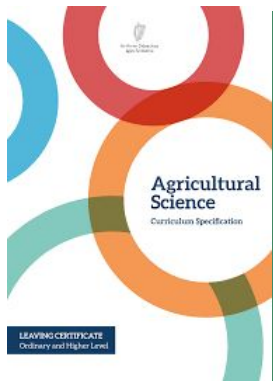
CPD Timeline



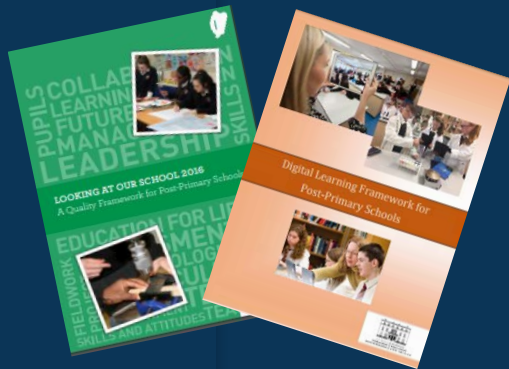
Year 3: September 2020 to May 2021

Purpose for Today

180 hours minimum duration
Higher & Ordinary level
September 2019 introduction
First examination June 2021
Assessment: Exam 75% IIS: 25%



To support teachers in developing the literacy skills of senior cycle Agricultural Science students, in particular the skills of report writing to support the recording of the IIS and SPAs which are informed by the scientific process



To explore the use of case studies as an inquiry approach in the Agricultural Science classroom and to consider how we are planning units of learning to support an inquiry approach

Timetable

| | |
|---|--|
| <p>Session 1 9:30 - 11:00</p> | <ul style="list-style-type: none"> • Introduction • Scientific reports and their features of quality • Supporting literacy skills through the use of digital technologies |
| <p>Tea/Coffee Break 11:00 - 11:20</p> | |
| <p>Session 2 11:15 - 1:00</p> | <ul style="list-style-type: none"> • Creating a classroom culture of inquiry – experiences and reflection • Authentic student inquiry • Exploring case studies as an inquiry approach |
| <p>Lunch 1:00 - 2:00</p> | |
| <p>Session 3 2:00 - 3:30</p> | <ul style="list-style-type: none"> • Planning to support an inquiry approach |

Key Messages



By creating a learning environment that allows research, inquiry and self-directed learning, teachers will allow students to assume responsibility for planning, researching, monitoring and evaluating their own work and in doing so develop a positive sense of their own capacity to learn both individually and collaboratively



The scientific method is integral to the process of writing scientific reports. Adopting this method will enable students to engage more successfully with aspects of the course including the recording of SPAs and the IIS



Examining farm based case studies as a pedagogical approach can incorporate different aspects of each strand along with cross cutting themes which allow for differentiation, implementation of key skills, supporting literacy and numeracy concepts contained in and required by the specification

Session 1

By the end of this session participants will have:

- Considered and discussed scientific literacy and literacy in the agricultural science classroom
- Explored scientific reports, discussed and analysed their features of quality
- Examined digital tools to support literacy and allow for differentiation





Scientific Literacy in the Agricultural Science Classroom

What does it mean to be scientifically literate?

Scientific principles are applied to testing stated hypotheses, which in turn leads to the solving of identified problems arising from the learner's own observations and perceptions of agricultural situations
(Specification page 6-7)

Scientific knowledge is constructed by the sharing of ideas and by developing, refining and rejecting or accepting these ideas

Science education provides a means by which students can interact with the world around them and understand how scientific concepts can be used to interpret the natural and physical world

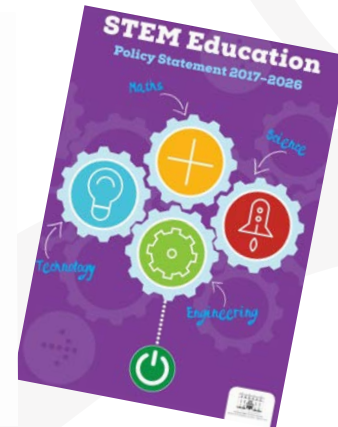
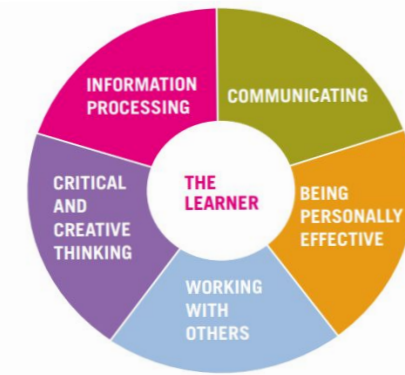
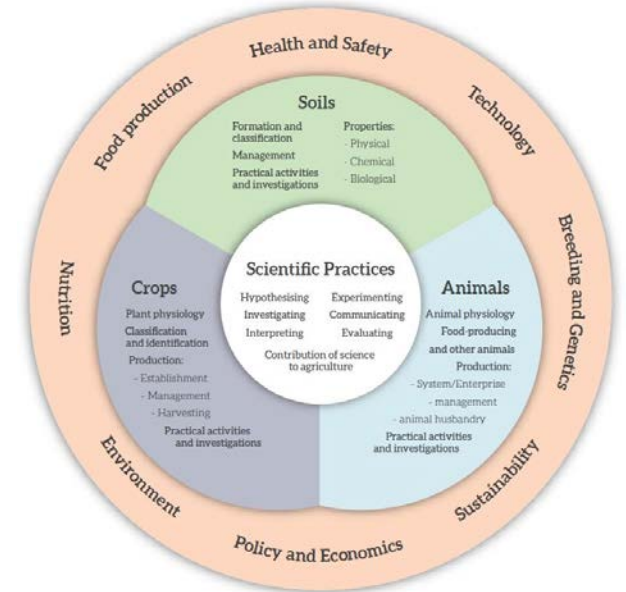


Figure 5: Key skills of senior cycle

Literacy in the Agricultural Science Classroom



pg 10

Where do students need literacy support in the agricultural science classroom?

“Students develop their reading, comprehension and writing skills when they research, examine, record, compare, and critique different agricultural practices, contexts and information”
Specification P12

- **Oral Language**
 - Speaking
 - conversations
 - debates
 - presentations
 - Listening and responding
- **Reading**
 - information texts
 - comprehension
 - vocabulary
 - fluency
- **Writing**
 - answering questions
 - recording findings
 - writing genres

Digital literacy
e.g. Research and presentations

Cross Disciplinary Writing

What is effective writing?

- Achieves the writer's goals
- Is appropriate for the intended audience
- Presents ideas in a way that clearly communicates the writer's intended content
- Elicits the intended response from the reader

(Graham et. al, 2016)

Writing
encourages
critical thinking

Writing occurs in
every discipline

Students develop their reading, comprehension and writing skills when they research, examine record, compare and critique different agricultural practices, contexts and information.
(Specification, page 12)

Scientific Reports for the Agricultural Science Specification



pg 12

“Practical laboratory and field investigative and experimental activities provide opportunities for the promotion of the scientific methodology”

Pg 15 Specification



Title and Research

Hypothesis and Prediction

Experiment

Results / Analysis / Conclusion

Accept Hypothesis

Reject Hypothesis

Evaluate and Report Results



Scientific method should be used for SPAs

Writing Scientific Reports - Features of Quality



pg 14

What is a Scientific Report?



Structure

- Title
- Hypotheses
- Prediction
- Variables
- Materials / Labelled diagram
- Procedure
- Results – Quantitative/Qualitative
- Graph (if appropriate)
- Analysis
- Conclusion
- Evaluation / Discussion

Language features

- Past tense
- Technical vocabulary
- Impersonal language
- Definitions or explanations
- Visual elements – diagrams, tables, charts
- Reflective

By examining and debating reports about contemporary issues in science, students develop an appreciation of the social context of science

By critically evaluating scientific texts and debating public statements about science, students engage with contemporary issues in agricultural science that affect their everyday lives

Practical laboratory and field investigations and experimental activities provide opportunities for the promotion of the scientific methodology (Specification page 14)

Session 1 - Plenary

By the end of this session participants should be able to:

- Considered and discussed scientific literacy and literacy in the agricultural science classroom
- Explored scientific reports, discussed and analysed their features of quality
- Examined digital tools to support literacy and allow for differentiation



Tea/Coffee Break

Enjoy!



Session 2

By the end of this session participants will have:

- Reflected on how your classroom has changed and your role in prompting change
- Effectively engaged with a unit of learning involving a farm-based case study, used a variety of teaching methods, literacy, numeracy and incorporated different strands and cross cutting themes
- Shared how farm - based case studies can be used to enhance teaching and learning



Teaching and Learning Reflection

Write down 5 different teaching techniques you have used in your classroom so far when teaching this specification



pg 25

Have you noticed any changes in your classroom since you have begun engaging with the new specification? How is your classroom different? What changes have there been to your practice?

How has your classroom become a more active, student centred environment?

What has been your greatest success? Your greatest challenge? Is there anything you would do differently? How?

What have your students learned? How do you know?



Teaching and Learning in the Agricultural Science Classroom

The variety of activities that students engage in will enable them to take charge of their own learning by setting goals, developing action plans, and receiving and responding to assessment feedback

Leaving Certificate Agricultural Science supports the use of a wide range of teaching and learning approaches

Students develop skills in scientific communication by collaborating to generate reports and present them to their peers

Through engaging in self-directed activities and reflection students assume responsibility for planning, monitoring and evaluating



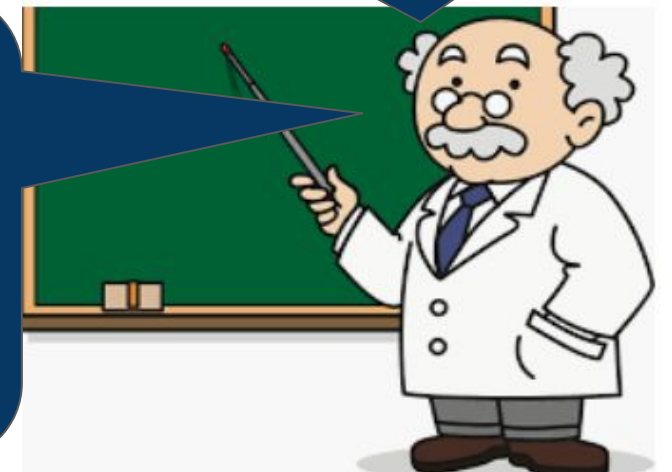
pg 14 specification

Using a Case Study as a Teaching Methodology

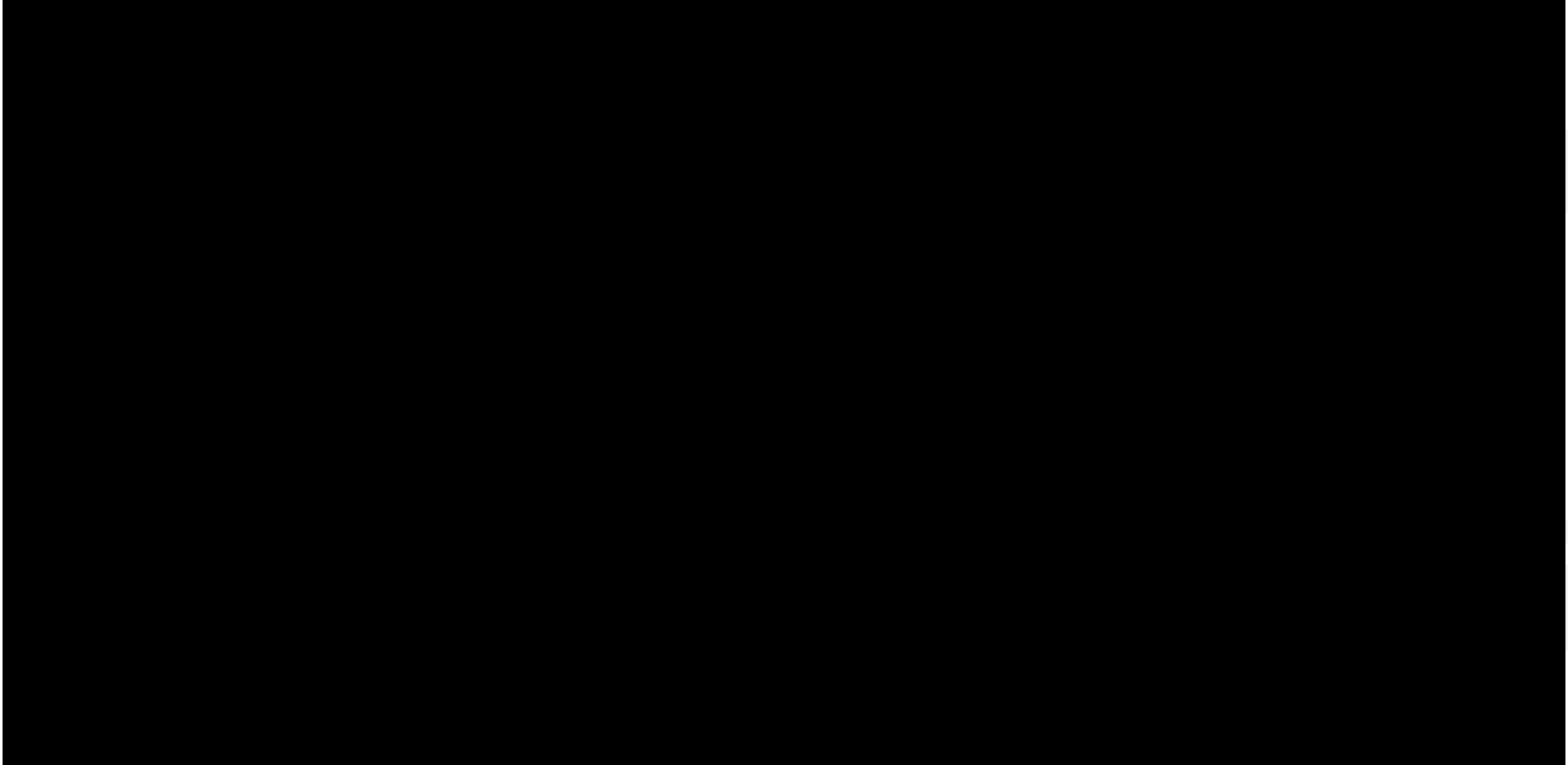
- Students review a real agricultural situation (a case) that poses a thought-provoking problem or dilemma
- The nature of a case study brings interest and relevance to the application of abstract concepts and theory in practice

“Case studies facilitate development of higher levels of Bloom’s taxonomy of cognitive learning; moving beyond recall of knowledge to analysis, evaluation and application”
(Bonney, 2015)

“Involves learning by doing, the development of analytical and decision making skills, the internalisation of learning, learning how to grapple with messy real-life problems, the development of skills in oral communications and often team work. It’s a rehearsal for life”
(Herreid, 1994)



Real Life Scenario - Dairy Case Study



Student Centred - Farm Based Case Study

Using the digital case study and the information stimulus attached to the registration link for this workshop



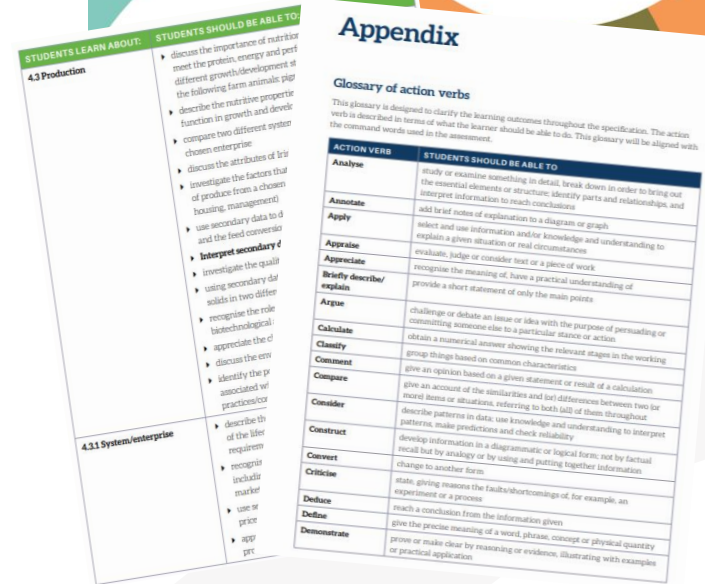
What student activities could be developed?

What do I need to do to get my students to carry out these activities?



What practical activities are possible?

What scaffolding is required?



Focus less on knowledge and more on comprehension, application, analysis, synthesis and evaluation

Exposed to diversity of decision contexts for defined problems

Increased participation in class activities and performance in assessment

Learn through application of knowledge and concepts

Learning through active critical thinking, analysis and debates

Increased student autonomy

Case Study Advantage

Opportunities to learn interpersonal relations, teamwork and communication in controlled settings

Involves problem - based learning and promotes development of analytical skills

Improve students' ability to synthesise complex analytical questions about real-world issues associated with scientific topics

Session 2 - Plenary

By the end of this session participants should be able to:

- Reflected on how your classroom has changed
- Effectively engaged with a unit of learning involving a farm-based case study, used a variety of teaching methods, literacy, numeracy and incorporated different strands and cross cutting themes
- Shared how farm - based case studies can be used to enhance teaching and learning



Lunch Break

Enjoy!



Session 3

By the end of this session participants will have:

- Discussed critical thinking as an open and investigative approach to learning so that students are challenged appropriately
- Discussed critical thinking skills in line with assessment
- Effectively planned project based units of learning that creates a learning environment which allows students to develop their key skills, conduct research and make informed decisions



Key Skills and the Agricultural Science Student

Students will solve relevant problems using careful observation, managing data, thoughtful analysis and clarity of expression to evaluate evidence, and make clear presentation of their proposed solution. Students will research up to date and balanced information and understand the limitations of science

Through the act of research, practical investigations and report writing, students will collaborate with each other and present their findings

Students will develop the skill of being personally effective as they develop strategies for managing, monitoring and evaluating their learning

Students may work collaboratively and through this they will learn from others, but more importantly they will be engaged in a social experience involving the understanding of interpersonal dynamics



Pg 13 Specification

Critical Thinking in the Specification



Assessment outcomes

The written paper will assess:

Critical thinking, the ability to analyse and evaluate information and to form reasonable and logical arguments, based on evidence

Problem solving based on integration, analysis and evaluation of qualitative and quantitative information and data
(pg 26 Specification)



Conclusions should be drawn and justified by the analysis of data
(pg 9 NCCA guidelines)

L.O. 1.3.a **Critically** examine the scientific process that was used to present a scientific claim

Make judgements and draw conclusions from your analysis taking into account any relevant limitations
(pg 5 SEC Report Structure)

L.O. 1.4.b Discuss, debate, reflect on and **critically** evaluate the outcomes of investigations, their own and those of others

Developing Critical & Creative Thinking Skills



google doc

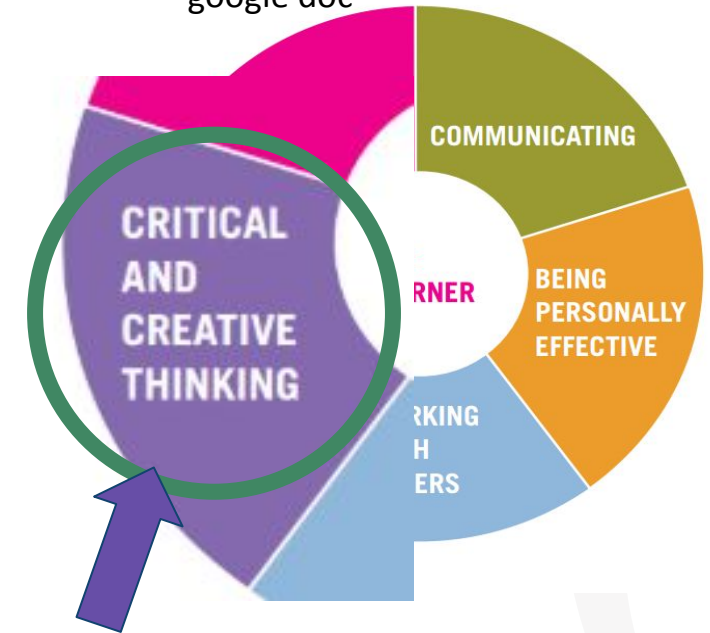
What are critical thinking skills and why do you think they are important?

Are we creating a teaching environment that allows the student voice to be heard?

How are we promoting curiosity in our classrooms? An instinct to explore

How would critical thinking skills help students with answering synoptic questions and the IIS?

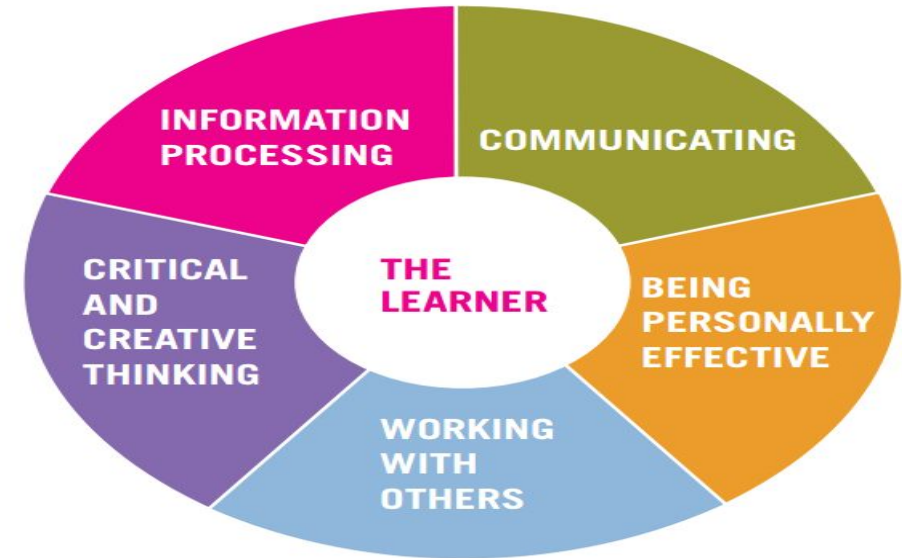
Students will develop their critical and creative thinking skills by examining relationships, developing and testing hypothesis, designing experimental tests to prove or disprove assumptions, exploring options, solving problems and applying those solutions to new contexts



Project based learning in the Agricultural Science classroom



What Happens When Students Engage in Project-Based Learning?



Key skills of senior cycle
Pg 13 Specification

Benefits of Project Based Learning

- Student centered approach to learning
- More enjoyable, satisfying and engaging
- Allows students to use and develop key skills
- Increased autonomy and participation
- Empowering learners fostering independence
- Actively involved in own learning
- Central to the spirit of the specification

“Through engaging in self-directed activities and reflection, students assume responsibility for planning, monitoring and evaluating their own learning and, in so doing develop a positive sense of their own capacity to learn”

Pg 14 Specification

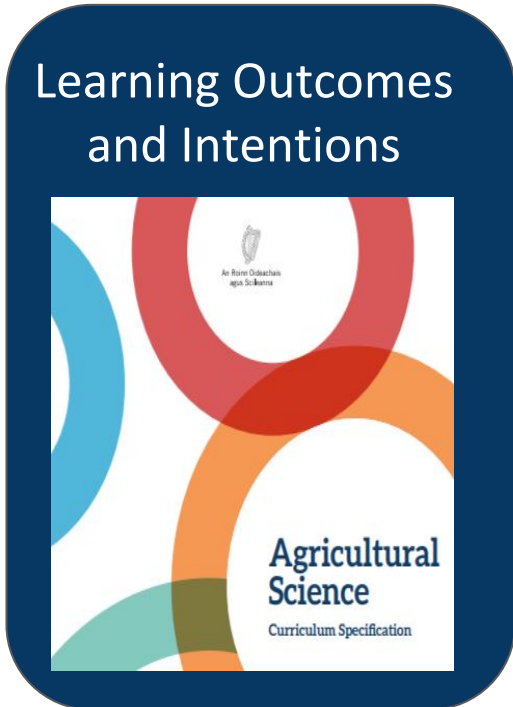
Promoting Project Based Learning (PBL) in the Agricultural science Classroom

“Helps raise achievement of all learners by focusing on learning”

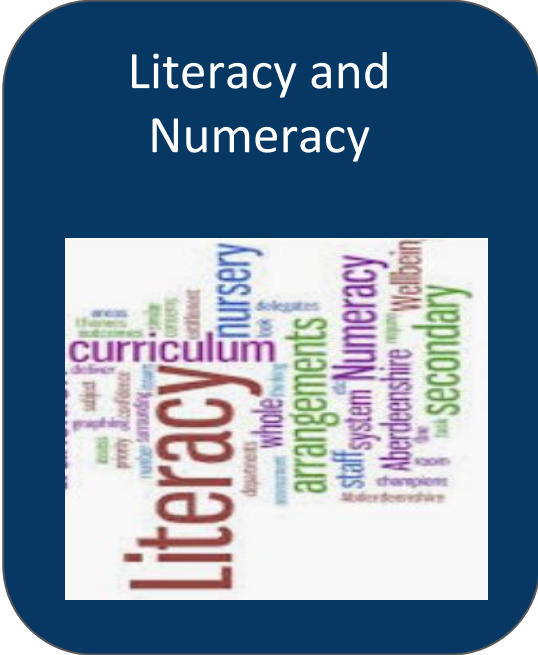
“Stimulates learners through hearing the ideas and opinions of others, giving them opportunities to react and discuss concepts”

“Helps to build positive relationships among learners, creating a learning community in which diversity is valued”

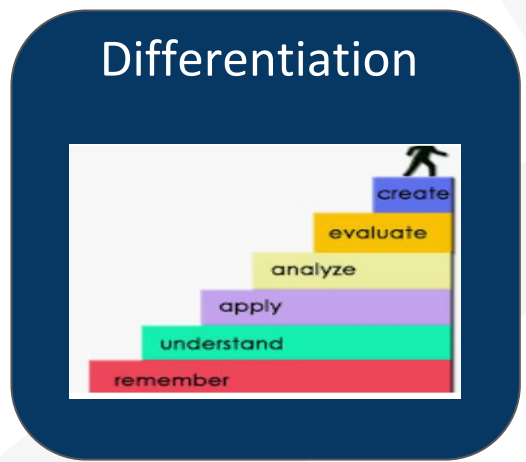
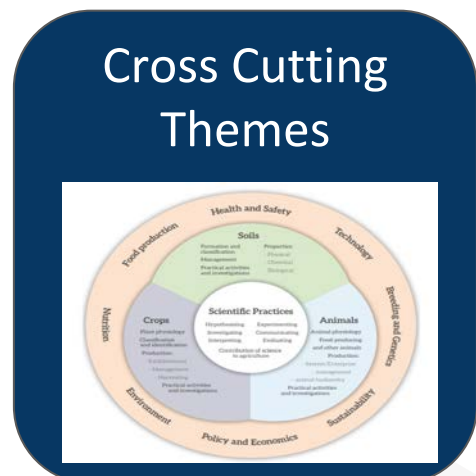
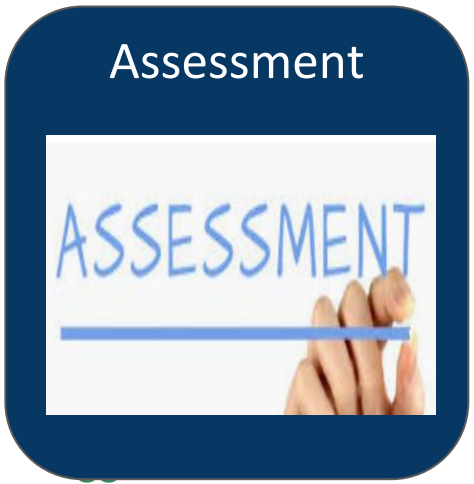
(Johnson, Johnson & Houlbec, 1994)



google doc



Creating a Project / Problem Based Unit of Learning



Feedback: How would you use Project Based Learning in the Agricultural Science Classroom?

Would it help students to engage with synoptic questions?

What key skills would your students use in PBL that are transferable to other parts of the course?

How would you use PBL as part of your teaching and learning?



Rich Task Design to support teaching, learning and assessment

Blended learning can promote and support an enquiry approach as students can access real world content and demonstrate their understanding in real contexts.

Three - Step Approach to Planning

1. Select the learning outcomes
2. Decide on feedback options
3. Plan and design teaching and learning activities
 - capitalise on digital resources
 - use students' environments and experiences
 - incorporate collaboration
4. Review and Evaluate



Session 3 - Plenary

By the end of this session participants should be able to:

- Effectively planned project based units of learning that create a learning environment which allows students to develop their key skills, conduct research and make informed decisions
- Provided an open and investigative approach to learning so that students are challenged appropriately
- Discussed critical thinking as an open and investigative approach to learning so that students are challenged appropriately



Bibliography

Bonney, K. M. (2015). Case study teaching method improves student performance and perceptions of learning gains. *Journal of microbiology & biology education*, 16(1), 21.

Dori, Y. J., & Herscovitz, O. (1999). Question-posing capability as an alternative evaluation method: Analysis of an environmental case study. *Journal of Research in Science Teaching: The Official Journal of the National Association for Research in Science Teaching*, 36(4), 411-430.

Herreid, C. F., Schiller, N. A., Herreid, K. F., & Wright, C. (2011). In case you are interested: results of a survey of case study teachers. *Journal of College Science Teaching*, 40(4), 76.

Konopka, C. L., Adaime, M. B., & Mosele, P. H. (2015). Active Teaching and Learning Methodologies: Some Considerations. *Creative Education*, 6, 1536-1545.

Wiliam, Thompson (2007), Leahy et al., 2015

Johnson, Johnson & Houlbec, 1994