

Agricultural Science 2019 v1.3

IA2: Sample assessment instrument

Student experiment (20%)

This sample has been compiled by the QCAA to assist and support teachers in planning and developing assessment instruments for individual school settings.

Student name

Student number

Teacher

Issued

Due date

Marking summary

| Criterion | Marks allocated | Provisional marks |
|-------------------------------|-----------------|-------------------|
| Research and planning | 6 | |
| Analysis of evidence | 6 | |
| Interpretation and evaluation | 6 | |
| Communication | 2 | |
| Overall | 20 | |

Conditions

| | |
|-------------------------|--|
| Technique | Student experiment |
| Unit | Unit 3: Agricultural production |
| Topic/s | Topic 1: Animal production B Topic 2: Plant production B |
| Duration | 10 hours class time |
| Mode/length | Written (e.g. scientific report): 1500–2000 words |
| Individual/group | Individual response: students may collaborate to develop the methodology and perform the experiment. |
| Resources | School science laboratory and library (online: internet and school intranet, databases, journals) |

Context

You have completed the following practicals in class:

- Survey pastures or use secondary data from satellite images (including vegetation maps) to analyse results to make reasoned judgments and secondary decisions about quality and quantity of available food.
- Formulate a ration for a selected animal.
- Compare the bone, muscle and fat percentages of different carcasses or cuts that are commercially available (mandatory practical).
- Analyse primary or secondary growth data to make judgments about animal nutrition. Students could analyse the growth data of animals in schools, ensuring that any work with animals is conducted in accordance with the 'Care and use of animals for scientific purposes' principles outlined in Section 1.2.4 of the syllabus.
- Analyse carcass feedback data and assess correlation with 'on-the-hoof judgments' (the practice of accurately aging an animal based on their body characteristics and proportions).
- Monitor and record the physical aspects of the environment of a selected animal.
- Design and conduct a plant trial to collect and analyse primary data on a factor that affects plant production (mandatory practical).

Task

Modify (i.e. refine, extend or redirect) an experiment in order to address your own related hypothesis or question.

You may use a practical performed in class, a related simulation or another practical related to Unit 3 (as negotiated with your teacher) as the basis for your methodology and research question.

To complete this task, you must:

- identify an experiment to modify*
- develop a research question to be investigated*
- research relevant background scientific information to inform the modification of the research question and methodology
- conduct a risk assessment and account for risks in the methodology*
- conduct the experiment*
- collect sufficient and relevant qualitative data and/or quantitative data to address answer the research question*
- process and present the data appropriately
- analyse the evidence to identify trends, patterns or relationships
- analyse the evidence to identify uncertainty and the limitations
- interpret the evidence to draw conclusion/s to the research question
- evaluate the reliability and validity of the experimental process
- suggest possible improvements and extensions to the experiment
- communicate findings in an appropriate scientific genre, i.e. scientific report.

* The steps indicated with an asterisk above may be completed in groups. All other elements must be completed individually.

Checkpoints

- Term 1 Week 6: Select modifications, develop research question and complete risk assessment
- Term 1 Week 7: Start experiment
- Term 2 Week 3: Collect and analyse data
- Term 2 Week 4: Submit draft
- Term 2 Week 8: Submit final response

Authentication strategies

- The teacher will provide class time for task completion.
- Students will provide documentation of their progress at indicated checkpoints.
- The teacher will collect and annotate one draft.
- Students will use plagiarism-detection software at submission of the response.
- Students must acknowledge all sources.
- The teacher will compare the responses of students who have worked together in groups.

Scaffolding

The response must be presented using an appropriate scientific genre (i.e. scientific report) and contain:

- a research question
- a rationale for the experiment
- reference to the initial experiment and identification and justification of modifications to the methodology
- raw and processed qualitative data and/or quantitative data
- analysis of the evidence
- conclusion/s based on the interpretation of the evidence
- an evaluation of the methodology and suggestions of improvements and extensions to the experiment
- a reference list.

An example of how one of the practicals could be modified to develop a research question

Practical that will be modified: Design and conduct a plant trial to collect and analyse primary data on a factor that affects plant production.

Research question: What is the relationship between level of nitrogen available and yield of French beans?

Developing the research question

| Steps | Details |
|---|--|
| 1. Identify the independent variable to be investigated. | Level of soil nitrogen. |
| 2. Identify the dependent variable. | Mass of pods/plant. |
| 3. Identify the methodology to be used. | Pot trial. |
| 4. Draft research questions. | <ul style="list-style-type: none">• Why is nitrogen important for the growth of French beans?• Will the timing of nitrogen application to soil determine the effect on plant yield in French beans? |
| 5. Refine and focus the research question. | What is the effect of increasing nitrogen levels on the yield of French beans? |
| 6. Present the research question to the teacher for approval. | What is the relationship between level of nitrogen available and yield of French beans? |

Instrument-specific marking guide (IA2): Student experiment (20%)

Criterion: Research and planning

Assessment objectives

2. apply understanding of animal production, plant production or agricultural enterprises to modify experimental methodologies and process primary data
5. investigate phenomena associated with animal production, plant production or agricultural enterprises through an experiment

| The student work has the following characteristics: | Marks |
|---|-------|
| <ul style="list-style-type: none"> • informed application of understanding of animal production, plant production or agricultural enterprises to modify experimental methodologies demonstrated by <ul style="list-style-type: none"> – a considered rationale for the experiment – justified modifications to the methodology • effective and efficient investigation of phenomena associated with animal production, plant production or agricultural enterprises demonstrated by <ul style="list-style-type: none"> – a specific and relevant research question – a methodology that enables the collection of sufficient, relevant data – considered management of risks and ethical or environmental issues. | 5–6 |
| <ul style="list-style-type: none"> • adequate application of understanding of animal production, plant production or agricultural enterprises to modify experimental methodologies demonstrated by <ul style="list-style-type: none"> – a reasonable rationale for the experiment – feasible modifications to the methodology • effective investigation of phenomena associated with animal production, plant production or agricultural enterprises demonstrated by <ul style="list-style-type: none"> – a relevant research question – a methodology that enables the collection of relevant data – management of risks and ethical or environmental issues. | 3–4 |
| <ul style="list-style-type: none"> • rudimentary application of understanding of animal production, plant production or agricultural enterprises to modify experimental methodologies demonstrated by <ul style="list-style-type: none"> – a vague or irrelevant rationale for the experiment – inappropriate modifications to the methodology • ineffective investigation of phenomena associated with animal production, plant production or agricultural enterprises demonstrated by <ul style="list-style-type: none"> – an inappropriate research question – a methodology that causes the collection of insufficient and irrelevant data – inadequate management of risks and ethical or environmental issues. | 2–1 |
| <ul style="list-style-type: none"> • does not satisfy any of the descriptors above. | 0 |

Criterion: Analysis of evidence

Assessment objectives

2. apply understanding of animal production, plant production or agricultural enterprises to modify experimental methodologies and process primary data
3. analyse experimental evidence about animal production, plant production or agricultural enterprises
5. investigate phenomena associated with animal production, plant production or agricultural enterprises through an experiment

| The student work has the following characteristics: | Marks |
|--|-------|
| <ul style="list-style-type: none"> • appropriate application of algorithms, visual and graphical representations of data about animal production, plant production or agricultural enterprises demonstrated by correct and relevant processing of data • systematic and effective analysis of experimental evidence about animal production, plant production or agricultural enterprises demonstrated by <ul style="list-style-type: none"> – thorough identification of relevant trends, patterns or relationships – thorough and appropriate identification of the uncertainty and limitations of evidence • effective and efficient investigation of phenomena associated with animal production, plant production or agricultural enterprises demonstrated by the collection of sufficient and relevant raw data. | 5–6 |
| <ul style="list-style-type: none"> • adequate application of algorithms, visual and graphical representations of data about animal production, plant production or agricultural enterprises demonstrated by basic processing of data • effective analysis of experimental evidence about animal production, plant production or agricultural enterprises demonstrated by <ul style="list-style-type: none"> – identification of obvious trends, patterns or relationships – basic identification of uncertainty and limitations of evidence • effective investigation of phenomena associated with animal production, plant production or agricultural enterprises demonstrated by the collection of relevant raw data. | 3–4 |
| <ul style="list-style-type: none"> • rudimentary application of algorithms, visual and graphical representations of data about animal production, plant production or agricultural enterprises demonstrated by incorrect or irrelevant processing of data • ineffective analysis of experimental evidence about animal production, plant production or agricultural enterprises demonstrated by <ul style="list-style-type: none"> – identification of incorrect or irrelevant trends, patterns or relationships – incorrect or insufficient identification of uncertainty and limitations of evidence • ineffective investigation of phenomena associated with animal production, plant production or agricultural enterprises demonstrated by the collection of insufficient and irrelevant raw data. | 1–2 |
| <ul style="list-style-type: none"> • does not satisfy any of the descriptors above. | 0 |

Criterion: Interpretation and evaluation

Assessment objectives

- interpret experimental evidence about animal production, plant production or agricultural enterprises
- evaluate experimental processes and conclusions about animal production, plant production or agricultural enterprises

| The student work has the following characteristics: | Marks |
|---|-------|
| <ul style="list-style-type: none">insightful interpretation of experimental evidence about animal production, plant production or agricultural enterprises demonstrated by justified conclusion/s linked to the research questioncritical evaluation of experimental processes about animal production, plant production or agricultural enterprises demonstrated by<ul style="list-style-type: none">justified discussion of the reliability and validity of the experimental processsuggested improvements and extensions to the experiment that are logically derived from the analysis of evidence. | 5–6 |
| <ul style="list-style-type: none">adequate interpretation of experimental evidence about animal production, plant production or agricultural enterprises demonstrated by reasonable conclusion/s relevant to the research questionbasic evaluation of experimental processes about animal production, plant production or agricultural enterprises demonstrated by<ul style="list-style-type: none">reasonable description of the reliability and validity of the experimental processsuggested improvements and extensions to the experiment that are related to the analysis of evidence. | 3–4 |
| <ul style="list-style-type: none">invalid interpretation of experimental evidence about animal production, plant production or agricultural enterprises demonstrated by inappropriate or irrelevant conclusion/ssuperficial evaluation of experimental processes about animal production, plant production or agricultural enterprises demonstrated by<ul style="list-style-type: none">cursory or simplistic statements about the reliability and validity of the experimental processineffective or irrelevant suggestions. | 1–2 |
| <ul style="list-style-type: none">does not satisfy any of the descriptors above. | 0 |

Criterion: Communication

Assessment objectives

7. communicate understandings and experimental findings, arguments and conclusions about animal production, plant production or agricultural enterprises

| The student work has the following characteristics: | Marks |
|---|-------|
| <ul style="list-style-type: none">• effective communication of understandings and experimental findings, arguments and conclusions about animal production, plant production or agricultural enterprises demonstrated by<ul style="list-style-type: none">– fluent and concise use of scientific language and representations– appropriate use of genre conventions– acknowledgment of sources of information through appropriate use of referencing conventions. | 2 |
| <ul style="list-style-type: none">• adequate communication of understandings and experimental findings, arguments and conclusions about animal production, plant production or agricultural enterprises demonstrated by<ul style="list-style-type: none">– competent use of scientific language and representations– use of basic genre conventions– use of basic referencing conventions. | 1 |
| <ul style="list-style-type: none">• does not satisfy any of the descriptors above. | 0 |



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