Gorokan High School

Assessment Task Notification

RESPECT | RESPONSIBILITY | PERSONAL BEST

Faculty: Science	**Course: Investigating Science**	**Time allowed: 12 weeks**
Teacher: Wallwork		**Email: karen.wallwork@det.nsw.edu.au**
Task number: 2	**Title: Depth Study Presentation**	
Year: 11	**Due date: Friday June 9, 2023 (Week 7, Term 2)**	**Weighting: 30%**

Syllabus outcomes assessed:

INS11/12-1 develops and evaluates questions and hypotheses for scientific investigation
INS11/12-2 designs and evaluates investigations in order to obtain primary and secondary data and information
INS11/12-3 conducts investigations to collect valid and reliable primary and secondary data and information
INS11/12-4 selects and processes appropriate qualitative and quantitative data and information using a range of appropriate media
INS11/12-5 analyses and evaluates primary and secondary data and information
INS11/12-6 solves scientific problems using primary and secondary data, critical thinking skills and scientific processes
INS11/12-7 communicates scientific understanding using suitable language and terminology for a specific audience or purpose
INS11-8 identifies that the collection of primary and secondary data initiates scientific investigations
INS11-9 examines the use of inferences and generalisations in scientific investigations

21st Century and employment related skills:

☒	Communication	☒	Use of technology
☒	Critical Thinking	☐	Self-reflection and refinement
☐	Creativity	☒	Problem Solving
☐	Collaboration	☐	Initiative and Enterprise
☒	Planning and Organising	☐	Cross-Cultural Understanding

Task description:

You will participate in a number of activities to understand how observations and collection of data can initiate scientific investigations.
This depth study will involve observations that focus on animal behaviour. One part of the depth study will involve a visit to Taronga Zoo, to take part in a workshop on animal observations.
Your task will involve a combination of completion of lessons on OneNote, as well as a hand-in component (a journal article).

2023

Year 11

Investigating Science

Depth Study Presentation

Module 1: Cause and Effect - Observing

Outcomes assessed:

INS 11/12-1

INS 11/12-2

INS 11/12-3

INS 11/12-4

INS 11/12-5

INS 11/12-6

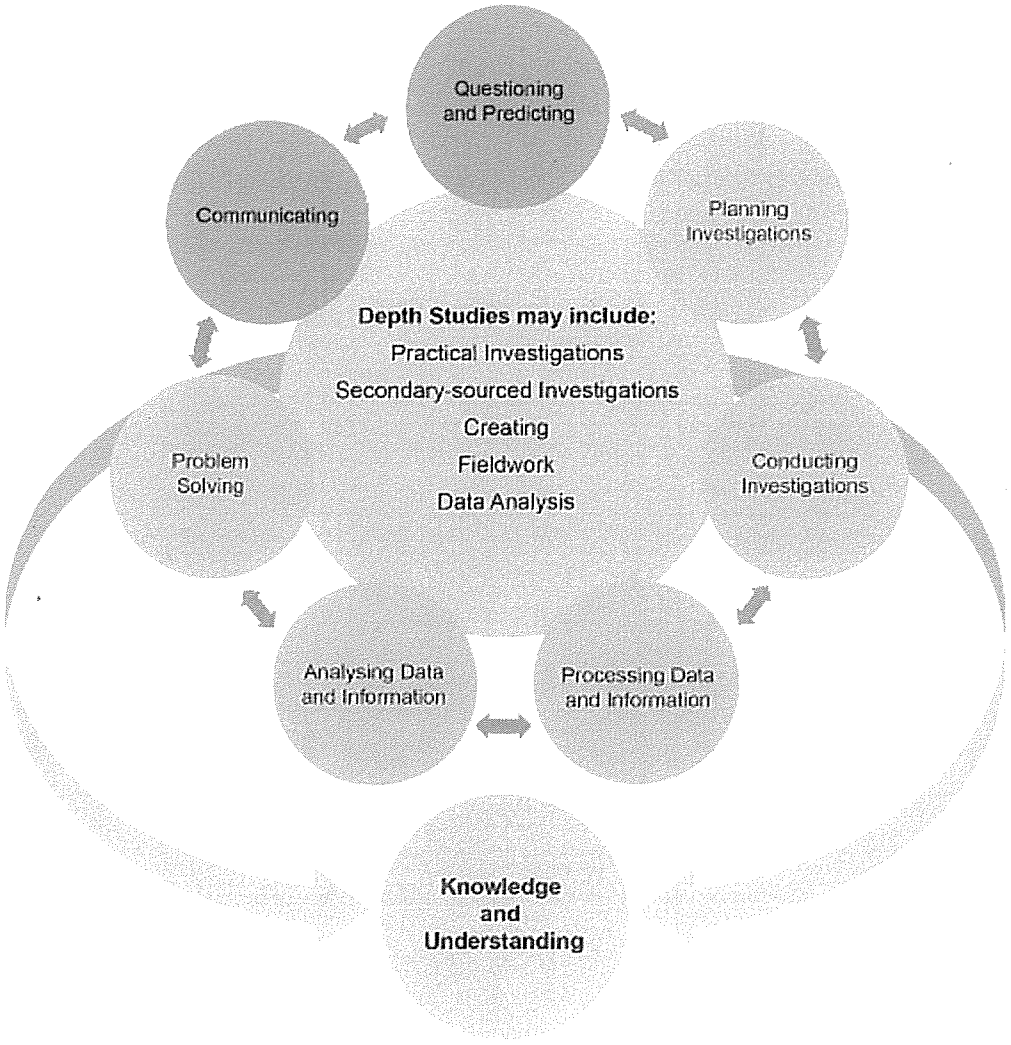
INS 11/12-7

INS 11-8

INS 11-9

Total = 44 marks

Requirements for a depth study



Assessment of Depth Studies must:

- address Questioning and Predicting, and Communicating skills outcomes
- address a minimum of two additional Working Scientifically skills outcomes
- include assessment of at least one Knowledge and Understanding outcome.

Requirements for Depth Studies

- A minimum of 30 hours of in-class time is allocated in both Year 11 and Year 12.
- At least one depth study must be included in both Year 11 and Year 12.
- The two Working Scientifically outcomes of Questioning and Predicting, and Communicating must be addressed in both Year 11 and Year 12.
- A minimum of two additional Working Scientifically skills outcomes, and further development of at least one Knowledge and understanding outcome, are to be addressed in all depth studies.

Outcomes

> identifies that the collection of primary and secondary data initiates scientific investigations INS11-8

Objective Students: • develop skills in applying the processes of Working Scientifically
Year 11 and 12 course outcomes A student:
Questioning and predicting INS11/12-1 develops and evaluates questions and hypotheses for scientific investigation
Planning investigations INS11/12-2 designs and evaluates investigations in order to obtain primary and secondary data and information
Conducting investigations INS11/12-3 conducts investigations to collect valid and reliable primary and secondary data and information
Processing data and information INS11/12-4 selects and processes appropriate qualitative and quantitative data and information using a range of appropriate media
Analysing data and information INS11/12-5 analyses and evaluates primary and secondary data and information
Problem solving INS11/12-6 solves scientific problems using primary and secondary data, critical thinking skills and scientific processes
Communicating INS11/12-7 communicates scientific understanding using suitable language and terminology for a specific audience or purpose

Your task:

You will participate in a number of activities to understand how observations and collection of data can initiate scientific investigations.

The observations and data collection will be focussing on animal behaviour. You will be provided with data collected during previous observations. Analysis of data will form a part of your task.

One part of this depth study involves an excursion to Taronga Zoo, to undertake a data collection activity similar to the ones done on a regular basis by the staff who work and volunteer at the zoo. The animals to be observed will be chosen on the day..

The entire task (ALL SECTIONS) will need to be completed and submitted using a combination of OneNote entries and a written journal article

The highlighted sections are assessable. There is a marking rubric attached.

Time will be allocated during class to complete the activities. N warnings will be issued for work that is not submitted by the due date.

Suggested Inquiry Question: How can animal observation in nature create an understanding of behaviour in captivity?

Introduction:

Zoos around the world have a common goal of conservation for all species, but particularly for animals who are endangered or close to extinction. Animals being kept in captivity would have their natural behaviours influenced by many factors created by being held in an artificial environment – restricted space to move around, human contact and even a different climate (amongst other things) could all change the way that these animals would behave.

Ideally, conservation needs animals to reproduce, ensuring that the numbers of these species are on the increase. This will hopefully guarantee that these animals are around for future generations to see.

Zoos have the ability to control the breeding and genetics of these animals by carefully selecting the desired genetic lines and with husbandry techniques. However, if the animals are not comfortable with their environment it will create stresses that could prevent successful reproduction, despite the efforts of the staff working with them.

Many scientists have studied animals in the wild to provide us with an understanding of how they live in nature without human influence. These findings have allowed zoos to change over time, from facilities that existed purely for human entertainment to ones that will ensure the species will continue to be around for many years to come.

So how does observing these species in their natural environment assist us with understanding how to successfully replicate their behaviours in captivity? Ultimately, the goal is to achieve success with breeding and continuing the genetic diversity of a species, but by knowing how that particular species lives in nature, the aim would be to make them comfortable and confident enough to survive and procreate.

Conservation is defined as the practice of protecting animal species and their habitats. Humans are behind the current rate of species extinction, which is at least 100–1,000 times higher than nature intended. In order to be able to perform the role of conservation, zoos need to ensure that the activities they undertake are with the aim of species protection, breeding and community education.

INS 11/12-1: a student develops and evaluates questions and hypotheses for scientific investigations – COMPLETE THIS PAGE ON ONENOTE

Answer the following questions:

- What is the name given to the study of animal behaviour?
- Why is it important?
- What benefit do we have from studying animal behaviour?
- Explore why scientists study animal behaviour (observations to inferences).
- Watch the following clip and then explain how observations can be influenced

https://www.youtube.com/watch?v=fwRbaKaj94o

(The observer effect could be corrupting scientific experiments)

Watch the following YouTube clips and answer the questions below:

Bozeman Science: https://www.youtube.com/watch?v=6hREwakXmAo

List the 8 types of animal behaviour discussed, define and give an example for each one.

Crash Course: https://www.youtube.com/watch?v=EyyDq19Mi3A

Name the three scientists credited with beginning animal observations and list the animals that they each studied. How was this research recognised in the scientific community?

Capturing unexpected animal behaviour:
https://www.youtube.com/watch?v=Y3ym8sEL8hI

Investigate zoos then and now:

- How has the knowledge gained over time changed how animals are kept in captivity?
- How is the interaction between humans and animals changed over time?
- Give at least TWO examples of these changes

Outline the role of zoos in conservation – why did their ethos change?

Using the information gained from watching the above clips, construct at least 3 inquiry questions that could be investigated scientifically (you must include a hypothesis and a concept that can be researched, as well as listing the variables involved).

INS 11/12-7: a student communicates scientific understanding using suitable language and terminology for a specific audience or purpose – TO BE COMPLETED AS A TYPED REPORT, SUBMITTED TO THE LIBRARY

The assessable sections of this depth study need to be submitted as a journal article. This article is designed to be presented in a publication, to demonstrate research findings to your peers.

Requirements:

- All questions to be answered in the lessons on OneNote
- Assessable sections will be graded, all other sections will have feedback provided
- The journal article needs to have:
    - Question to be answered (1 chosen from the 3 original inquiry questions – see INS 11/12-6)
    - Background research
    - Hypothesis
    - How the investigation was conducted (each step listed in detail)
    - Analyse data collected and draw conclusions
    - Answer in the positive or negative (draw a conclusion if the results align with the hypothesis, or construct a new hypothesis if the results do not align)
    - Suggested inquiry questions for the future
    - Sources cited in correct referencing methods

- The article needs to be visually interesting, to appeal to and engage an audience
- Maximum of 2000 words, maximum of 2 pictures (not including data representation)

INS 11/12-2: a student designs and evaluates investigations in order to obtain primary and secondary data and information ***– COMPLETE THIS PAGE ON ONENOTE***

OBSERVATION BEGINS WITH A KEEN EYE

OBSERVING ANIMAL BEHAVIOUR

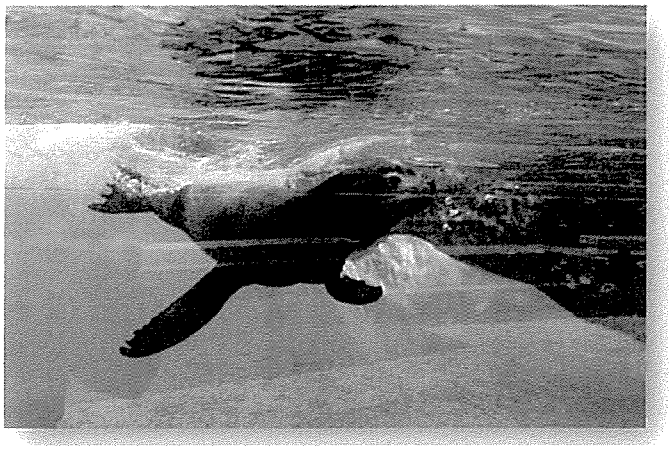
This depth study introduces students to the necessity of observation to drive scientific investigation. Taronga zoo is the perfect environment to plan, observe and record animal behaviour. Behavioural observations allow scientists to collect and record data, which enables them to test hypothesis to ensure animal wellbeing and survival.

Students will learn about primary data collection through authentic scientific animal observations, guided by zoo scientists and experts.

OUTCOMES

Knowledge and Understanding:
INS11 – 8 identifies that the collection of primary and secondary data initiates scientific investigations

Working Scientifically:
Questioning and predicting INS11-1
Communicating INS11-7
Planning investigations INS11-2
Conducting investigations INS11-3



Whilst at the zoo, you will spend some time conducting ethograms - observations of a chosen species and how they behave. There will be three different activities that will involve observation, data recording and analysis of collected information.

Evaluate the following (to be completed prior to the zoo visit):

- What are the risks associated with and while collecting data?
- What are the ethics surrounding animals in captivity?
- List the materials and technology required to conduct observations and collect data.

The zoo will provide data that has been previously collected during regular ethograms - we will be processing and analysing that data so that we can compare our results.

We will also need to justify and evaluate the variables and controls involved with the observations conducted.

How do we ensure that our results are valid and our data collection reliable?

NS 11/12-3: a student conducts investigations to collect valid and reliable primary and secondary data and information ***-COMPLETE THIS PAGE ON ONENOTE***

Choose a famous ethologist and write a biography. You are to include:

- Their name and life span
- The animal(s) studied and how they conducted their research
- The main findings of their research and how these results changed the way that we handled those animals in captivity
- To be submitted as A4 page with a picture (through OneNote)
- Include a bibliography (using correct referencing methods)

Observations and data collection will take place during the excursion to Taronga Zoo, to be held on March 22.

- You will conduct an analysis of the risk assessment provided by the zoo (prior to the excursion), to evaluate any risks associated with the data collection. What are the risks (if any) and how can they be managed?
- Analyse the data collected:
    - Did the collection criteria make the results valid and reliable?
    - Outline the method used to collect the data for each activity. Did this methodical collection ensure accuracy of results?
    - Do our results compare with previously collected data from Taronga Zoo or any other facility that houses the same species? (ensure that any secondary information used is referenced)

INS 11/12-4: a student selects and processes appropriate qualitative and quantitative data and information using a range of appropriate media – INCLUDE THIS PART IN YOUR JOURNAL ARTICLE

Organise the data collected during the zoo visit:

- It needs to be a visual representation, in any format of your choice (graphs, tables, charts etc).
- You need to have separate visual representations of the *quantitative* and *qualitative* results

Provide additional information on data collection:

- Are there any different methods that could be employed to collect the data?
- Should there be training involved with observations? Explain why or why not.
- What is meant by "standardised methods"? Why is this important when it comes to conducting research?

INS 11/12-5: a student analyses and evaluates primary and secondary data and information – INCLUDE THIS PART IN YOUR JOURNAL ARTICLE

Identify any trends, patterns and/or relationships in the data collected.

Recognise any error, limitations or uncertainty in the data collected – what kinds of things might go wrong, cause any false results or make the data seem very different to previously collected information.

Evaluate:

- Relevance (can society benefit from the results?)
- Accuracy
- Validity
- Reliability

Use the attached document to help you to determine what each of these terms means (you need to use the definitions to assess whether your observations were valid, reliable and accurate).

Suggest any improvements for the investigations.

Construct a conclusion based upon the data collected (from both the zoo and secondary sources).

NS 11/12-6: a student solves scientific problems using primary and secondary data, critical thinking skills and scientific processes* – *INCLUDE THE ANSWER TO YOUR CHOSEN QUESTION IN YOUR JOURNAL ARTICLE

Explain how the observations gathered could drive further investigation? (use the data collected and discuss how this could instigate more studies your chosen species in captivity).

Answer your original question – you are to choose *ONE* of your questions that you formulated earlier and answer that question based upon the knowledge that you have gained throughout this depth study (by writing a journal article).

ANSWER THIS SECTION IN ONENOTE

Cultural sensitivity and conservation:

Communities that are established in areas that have wild animals need to be able to live together, side by side, preferably without harm to one another.

- What are the threats to the native populations of your chosen species?
- Construct a food web for your species
- Provide some suggestions about changing the mentality of the local communities surrounding your chosen species habitat – how could we help them to learn to live together, without interfering with the species?

Sustainability and conservation:

- Explain how we can maintain life within human built environments (specific to your chosen species)

Lastly, you need to reflect on your own learning using 3-2-1:

- 3 things that you understood
- 2 things that you found most beneficial to learn
- 1 thing that you still don't understand

VALIDITY, RELIABILITY & ACCURACY

The Stage 6 syllabus asks students to distinguish between these terms in both first-hand investigations and when using secondary sources. NB. Students often confuse these terms.

References to validity, reliability and accuracy in the stage 6 syllabus:

Skills content 11/12-3: conducts investigations to collect valid and reliable primary and secondary data and information
Skills content 11/12-5: analyses and evaluates primary and secondary and information

When researching information, primary data and information is what you collect and observe yourself. When using secondary sources (eg. articles from journals, mass media, textbooks etc), it is important to identify your sources in the correct manner and the information must be **accurate.**

To ensure secondary sources are accurate, the information from the site or source must be both **valid and reliable.**

Validity

To determine if the information you are gathering is **valid**, you must consider or evaluate the following:

- the author of the article's credentials (i.e. the author is qualified in this area). For example, was the author a teacher, a scientist in that field etc?
- whether the purpose of the article is not resulting in bias
- whether the site or publication is reputable, i.e. .gov.edu, biology textbook
- whether the data was gathered using an appropriate method and measuring devices
- whether it is current (check date)
- whether the information relates to the problem or hypothesis being investigated

This means that if your information is current, written by an expert in the area you are investigating, without bias and is in a reputable publication, then your information could be considered valid.

Reliability

To determine if the information you are gathering is **reliable**, you must consider or evaluate the following:

- whether the information can be substantiated in more than **one valid source**. (i.e. is the information consistent with information from other reputable sources?).

This means that if you can find similar information in at least two valid sources, then your information could be considered reliable.

For first-hand investigations:

Students planning a first-hand investigation must consider issues related to accuracy, reliability and validity. These will impact on the choice of equipment and how confident they are about the conclusions drawn from the results of the investigation.

Validity

A valid experiment is a fair test. A method is valid if:

- it investigates what you think it will investigate (i.e. the procedure actually tests the hypothesis and the experiment includes an appropriate range of values).
- it incorporates suitable equipment (e.g. measuring cylinder to measure volume rather than a beaker)
- variables are controlled
- appropriate measuring procedures are included

Discussions about validity must:

- identify what validity is
- identify the factors that affect the validity of the particular experiment you are considering (the variables that must be controlled, the appropriate equipment, the range of values etc)
- assess the overall validity of the experiment

Reliability

A reliable experiment has results which can be obtained consistently. To ensure that results are reliable:

- the experiment must be repeated and consistent results obtained (within an acceptable margin of error)

The experiment should be repeated at least twice (i.e. carried out three times) and the results averaged. This ensures that the effect of random errors is minimised or that the outliers can be disregarded or removed. Random errors are errors that might affect your experiment the first time you do it, but not the second or third for example.
Note: Repetition will only determine reliability (it will NOT improve it). Measurements can be reliable without being valid. However they cannot be valid unless they are reliable!

Discussions about reliability must:

- identify what reliability is
- identify that reliability is increased by repeating the experiment and averaging the results
- identify that this minimises the effect of random errors/outliers and/or allows them to be removed or disregarded
- give examples of possible random errors that may have crept into the experiment you are considering
- assess the overall reliability of the experiment

Accuracy

Accuracy depends on the design of the experiment (i.e. the validity of the method) and the sensitivity of the instruments used. Results are accurate if:

- they are close to the true value of the quantity being measured
- they can be substantiated in secondary sources

Note: Accuracy is important by making the experiment as valid and reliable as possib

	Band 6 (5 marks)	Band 5 (4 marks)	Band 4 (3 marks)	Band 3 (2 marks)	Band 2 (1 mark)
Knowing & Understanding (INS 11-8/9) 10 marks	demonstrates an extensive knowledge and understanding of scientific concepts, including complex and abstract ideas	demonstrates thorough knowledge and understanding of scientific concepts, including complex and abstract ideas	demonstrates sound knowledge and understanding of scientific concepts	demonstrates basic knowledge and understanding of scientific concepts	demonstrates limited knowledge and understanding of scientific concepts
Identifies that the collection of primary and secondary data initiates scientific investigations	Explicitly demonstrates that the data collected initiates further research to answer the inquiry question Demonstrates extensive understanding that observation and measurements are essential to explore an idea	Demonstrates that the data collected can drive further investigation to answer the inquiry question States that observations and measurements were made, but does not connect this to future investigations	Direct statement that data collection does initiate scientific investigation, but does not answer the inquiry question	Limited evidence of the link between data collection and scientific investigation	No evidence of the link between data collection and scientific investigation
Questioning & predicting (INS 11/12 -1) 6 marks	applies knowledge and information to unfamiliar situations to propose comprehensive solutions or explanations for scientific issues or scenarios	applies knowledge and information to unfamiliar situations to propose explanations for scientific issues or scenarios	applies knowledge and information relevant to scientific issues or scenarios	recalls scientific knowledge and information	
	Develops at least 3 inquiry questions that can be investigated scientifically Include a hypothesis and variables for each question	Develops at least 3 inquiry questions that can be investigated scientifically No evidence of hypothesis or variables	Develops 2 inquiry questions	Develops 1 inquiry question	No inquiry question formulated
Processing & Analysing (INS 11/12-4/5) 12 marks	selects, processes, and interprets accurate, reliable, valid, and relevant qualitative and quantitative, primary or secondary data, and represents it using a range of scientific formats to derive trends, show patterns and relationships, explain phenomena, and make predictions	selects, processes, and interprets accurate, reliable, valid, and relevant qualitative and quantitative, primary or secondary data, and represents it using a range of scientific formats to derive trends, show patterns and relationships	processes and interprets primary and secondary data, and represents it using a range of scientific formats	processes primary or secondary data, and represents it using scientific formats	provides simple descriptions of scientific phenomena

	Represents both qualitative and quantitative data using scientific formats Applies correct quantitative processes to data collected Correctly derives trends, patterns and relationships in data and explains relevance Correctly assesses error, uncertainty and limitations in data and suggests ways to counteract these Correctly defines and assesses relevance, accuracy, validity and reliability of investigation Suggests ways to improve the investigation	Represents both qualitative and quantitative data using scientific formats Applies quantitative processes to data collected Correctly derives trends, patterns and relationships in data but does not explain relevance Correctly identifies error, uncertainty and limitations in data Correctly defines and identifies relevance, accuracy, validity and reliability of investigation Gives one good idea for improvement for the investigation	Represents both qualitative and quantitative data in scientific format No quantitative processes applied to data Can identify trends, patterns and relationships in data Defines relevance, accuracy, validity and reliability but does not relate to investigation Suggestion for improvement of investigation is basic	Represents data in scientific format but not separated into quantitative and qualitative No quantitative processes applied to data Identifies only a trend, pattern or relationship in data Defines only relevance, accuracy, validity or reliability Suggestion for improvement of investigation incorrect or irrelevant	Represents data, but not in scientific format or separated into quantitative and qualitative No quantitative processes applied to data No identification of trends, patterns or relationships in data No identification of relevance, accuracy, validity or reliability of investigation No suggested improvements for investigation
Communicating (INS 11/12-7) 16 marks	communicates scientific understanding succinctly, logically, and consistently using correct and precise scientific terms and application of nomenclature in a variety of formats and wide range of contexts	communicates scientific understanding, logically, and effectively using correct scientific terms and application of nomenclature in a variety of formats and wide range of contexts	communicates scientific understanding effectively using scientific terms and application of nomenclature	communicates scientific understanding using basic scientific terms and application of nomenclature	communicates scientific understanding using limited scientific terms

	Journal article is in the correct format and structured to assist the audience to navigate content and concept Written article has comprehensive defined structure with excellent transitions within and between paragraphs All the components of a scientific journal article are evident Diagrams and tables internally referenced and annotated The appropriate use of scientific notations, nomenclature and scientific language is used consistently throughout the article Succinct summary of investigation with ideas that impact the reader Sources cited properly and acknowledged internally and at the end of the report. Journal article succinctly answers the inquiry question posed by author	Journal article uses the correct format and is structured to assist the audience to move through content and concepts ·Written article has clearly defined structure with good transitions within and between paragraphs ·Most of the components of a scientific journal article are evident Diagrams and tables relevant and well labelled. ·The appropriate use of scientific language is sighted regularly throughout the article. Thorough summary of investigation with clear conclusive ideas ·Sources are cited at the end of the report only and some internally throughout the report. Journal article satisfactorily answers the question posed by author	Journal article format helps the audience to understand content and concepts. Written article has a somewhat clear and logical structure with basic transitions within and between paragraphs. Diagrams and tables relevant but not well incorporated Language for research unmodified from original text ·Language clear, includes some scientific metalanguage. Satisfactory summary of the investigation with final conclusive ideas Some sources are cited at the end of the report only and some internally throughout the report. Journal article gives a basic answer to the question posed by author	Journal article lacks clearly defined structure, difficult for audience to follow. Missing some content or concepts. Diagrams and tables included may not be relevant or well incorporated The language is sometimes ambiguous or unclear - resembles speech written down with little scientific metalanguage Basic summary of the investigation – weak connections made between the information in the article ·Sources are cited at the end of the report only and/or some internally throughout the report. Journal article gives a yes/no answer to the question posed by author	Limited responses to tightly scaffolded investigation Diagrams and tables are not relevant The language is ambiguous or unclear, resembles information that has been cut and pasted No summary of investigation provided. No sources are cited at the end of the report or internally throughout the report. Journal article does not answer question posed by author

Total = /44

Teacher comments: