



Motto:
"Not for self but for others"

Aspley State High School Science Department

Subject: Biological Science
Identification: Extended Experimental Investigation (EEI)
Topic: My Backyard

Date issued : Week 6: 20th Aug 2009
Draft date : Week 10: 15th Sept 2009

Due date: WED OCTOBER 15TH 2009
Time: 6 weeks

Name: _____

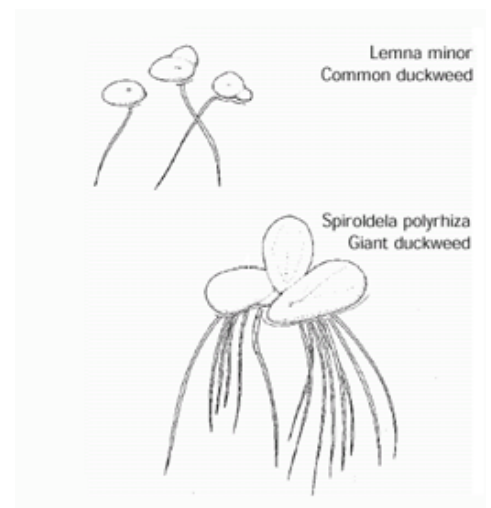
Class: _____ Teacher: _____

Result Summary

Part	Component	A+	A	A-	B+	B	B-	C+	C	C-	D+	D	D-	E+	E	E-
A	Understanding															
B	Investigating															

Duckweed is a free floating plant often found in South East Queensland waterways it can make the water unsightly and unappealing for swimming; thick growth of Duckweed can have a negative affect on the abiotic and biotic factors. An overgrowth of Duckweed in South East Queensland can decrease the viability of the waterways within a short period of time.

However a controlled growth of Duckweed in our waterways can be beneficial to its health. While on year 11 camp at Maroon Dam situated in South East Queensland, a group of students were kayaking on the lake and they noticed Duckweed was covering most of the lake. Their instructor, Sharon explained to the group "the Duckweed has greatly decreased this winter after the rain, compared to last year" Sharon then asked the year 11 Biology students to take samples of this duckweed back to the school lab and **to investigate the factors that affect the growth of Duckweed in South East Queensland.**



Year 11 Biology Extended Experimental Investigation Task:

Design and conduct an extended experimental investigation to test the growth responses of a Duckweed to one of the variables listed below.

- 1. Sunlight**
- 2. Nutrients: Nitrogen and Phosphorus**
- 3. Temperature**
- 4. pH**
- 5. Salinity**
- 6. Grey water**

n.b if there is another variable that you would like to test please discuss this with your teacher before beginning.

Your investigation requires that you:

- Formulate and justify a suitable research question (This leads to a hypothesis. In the investigation you will find evidence to support or not support the hypothesis)
- Plan and design an investigation to gather qualitative (could include photos) and quantitative data. This includes organizing to borrow or use school equipment where required, and planning your investigation to safety and ethical standards are met.
- Draw conclusions from your data with regard to the posed research question.
- You are also required to maintain a scientific journal, to document all research, primary data and secondary data as evidence of conducting the extended experimental investigation. This must also be handed in along with your scientific report.

The purpose of an EEI is to communicate the results of your investigations. Your report will have the following format:

Title page	The Title page should include title, author, teacher, date of submission. The title should be concise and informative .eg Different Common Plants used as Acid Base Indicators. The Effect of Salt on Marigolds. The Effect of Changing Temperature on Yeast Reactions.
Contents	The contents should list sections and provide page locations
Abstract	The abstract is a precise summary of the whole report. It should preview the contents of the report so that the reader can judge whether it is worth their while reading the whole report. An abstract provides a clear overview of the aim of the investigation, the trends identified in the results and a brief evaluation of the investigation.
Introduction	The introduction needs to let the reader know why the report is important and introduce the broad context in which your investigation fits. It should also include a statement of your hypothesis. This section also includes any research in the literature to enhance the reader's understanding of salinity, and how increased salt effects plant growth.
Aim	A statement of what you are investigating
Hypothesis	A statement of what you think will happen, based on observations or scientific theory. You must make a statement about the two variables that you are investigating.
Materials	All equipment should be listed in dot point format.
Method	The method is a detailed description of the steps used to conduct the investigation. The method should be very precise and describe each test so that it can be demonstrated that the experimental variables were controlled. This section should be written in the past tense. Safety – make sure that safety and ethical standards are met
Variables	Independent variable: The thing you change on purpose Dependent variable: The thing you measure Experimental variable: The things you keep the same to make a fair test. Control: The control shows what would happen if things were not changed (kept constant). Not all experiments have a control.
Results	The results are a factual account of what you found. It is usually presented as a data table . The results and graphs are usually averaged results, with the raw data presented in the appendices. Presenting data as averages allows you to draw attention to any trends in the data. This section is usually written in present tense. Remember to number and title each data table and graph: Eg Data Table One : Temperature of the Water at Different Voltages
Discussion	The discussion should include an interpretation and explanation of the results, reference to the hypothesis and literature and any new investigation questions or areas for future research. Using science concepts, explain patterns, trends or relationships you have identified in your data. What is your conclusion? Is your hypothesis supported or not supported? What were the main sources of experimental error? (eg sample size and selection, measurement error, poor control of variables) How confident are you of your conclusions? How much uncertainty or error is associated with your data? How could the design of the experiment be improved to reduce error? Can you make a general statement or generalisation about your experiment? If no generalisation can be made or the experiment gave strange results then the statement:" No valid conclusion can be made using the results obtained" can be used.
Conclusion	A short statement. Did the results support or not support the hypothesis?
References	Refer to ASHS ISC homepage for bibliography
Appendices	Appendix One: The raw data collected through out the experiment Appendix Two: Photographs of experiment design

SCIENTIFIC JOURNAL

Your scientific journal must be presented in an exercise book (48 page minimum) Collecting and organizing data is a component of experimental investigations. The scientific journal must be brought to each class and signed off at each stage of the report. Failure to present serious consequences will be ensue.

Page One — has details of your name, your class, students in your group and your teacher.

Page Two – Criteria Sheet must be glued in

Page Three – Task Sheet must be glued in.

Page Four – Scientific Journal Due dates

Page Five – Draft checklist

Your journal will catalogue - information gathered for your report and internet sites visited, reflective journal on different stages of the experiment, errors or uncertainties.

Due Date	Task	Signature
Week 6: 20-08-09 TERM 3	Hand out assignment Scientific Journal and set up Discuss and present teacher with investigation plan.	
Week 7 24-08-09 TERM 3	Set up practical investigation	
Week 9: 7-09-09 TERM 3	<ul style="list-style-type: none">• Draft Checklist• Evidence of Sci question , Aim, Hypothesis, materials, methods in Sci Journal• Evidence of practical set up and progress check.	
Week 10: 14-09-09 Draft Due: end of the week. TERM 3	Part 1- Abstract and Introduction Part 2- Experimental write up and data tables and graphs Part 3- Discussion	
Week 2 DUE DATE: Week Beginning 15 TH OCT 09	Part 1- Write Up: EEI Part 2- Scientific Journal	

Student Ownership Statement.

Yr 11 Biology Task 4 - EEI

Factors that can affect the growth of Duckweed in South East Queensland.

I declare that:

This assignment is my own work and I have not copied other student's work or directly from textbooks or other sources. I have not gained unfair assistance from other students, parents or guardians.

STUDENT SIGNATURE _____

DATE SUBMITTED: _____

TEACHER SIGNATURE _____

**Year 11 Biological Science
Duck Weed EEI
Draft check sheet**

Name: _____

Check date: _____

Teacher: _____

Scientific Question	
Hypothesis being tested.	
Plants used	
Independent Variable	
Dependent variables	Quantitative
	Qualitative
Experimental variables	Minimum 10
Method	
Safety issues?	

Year 11 Assessment Task 4 Extended Experimental Investigation - Our backyard

Name: _____

Criteria	A	B	C	D	E
Understanding Biology	The student is able to acquire, construct, and communicate knowledge and understanding of concepts and theories of Biology by:				
1. Describe biological ideas as they pertain to plants and their growth responses to the chosen variable (either: sunlight, nutrients, temperature, pH, salinity or grey water) (Introduction Information)	Makes links between related ideas and identifies the biology that underpins a plant's growth response to the chosen variable in the environment to thoroughly reveal all meaningful interrelationships; explains all background information for inclusion in the introduction.	Thoroughly explains most ideas relating to a plant's response to the chosen variable in the environment and describes interrelationships related to background information for inclusion in the introduction.	Describes ideas relating to a plant's response to the chosen variable in the environment and describes interrelationships and some background information for inclusion in the introduction.	States a limited amount of background information relating to a plant's response to the chosen variable in the environment using terminology relevant to concepts for inclusion in the introduction,	States terminology ideas relevant to a plant's response to salinity environment.
3. Apply and link ideas concepts and theories to explain phenomena in a range of situations (Discussion Information)	Applying knowledge and understanding about organism response to the environment to link the interpretation of the results to the theory, to demonstrate an excellent understanding of the concepts in the discussion.	Applying knowledge and understanding about organism response to the environment to link the interpretation of the results to the theory, demonstrates a good understanding of the concepts in the discussion.	Applies knowledge and understanding about organism response to the environment to discuss the results in relation to the theory, demonstrates a sound understanding of the concepts (In discussion)	Recalls that there is a link between results and theory. Demonstrates a poor understanding of the concepts in the discussion	

Criteria	A	B	C	D	E
Investigating Biology	The student is able to collect biological data, make choices, analyse data, make decisions and solve problems to demonstrate processes in biological investigation				
1. Identify and formulate questions and hypothesis for investigations. (Researchable question, aim and hypothesis)	Formulates a justifiable research question.. Aim is clearly described which makes links to the hypothesis. Develops a well worded testable hypotheses showing the expected relationship between the two variables.	Formulates a researchable question. Aim is clear and is related to the hypothesis . Hypothesis is clear and testable proposed showing the expected relationship between two variables.	Identifies a researchable question Aim is clear . The hypothesis is testable but the wording is unclear .	Follows instructions to collect and organise data about organisms' responses to the environment.	Uses supplied information to make statements about organisms' responses environment.
2. Design, manage and carry out experimental investigation. (Method, Scientific journal)	Designs, modifies and implements investigation to test hypothesis. Identifies all variables to test hypothesis. Identifies and addresses safety/ethical issues. Demonstrates planning, timelines, drafts, responds to feedback on Sci Journal. Presents journal and EEI and notes on time. References are appropriately acknowledged . Criteria sheet attached.	Selects, modifies and implements an appropriate procedure specific to the research question. Identifies several experimental variables that can be used to test the hypothesis. Identifies and addresses most safety /ethical issues. Demonstrates planning, drafts, research, presents Sci journal and notes on time. References are appropriately acknowledged , Criteria sheet attached	Selects and implements an appropriate procedure specific to the research question but may lack clarity. Identifies several experimental variables that can be used to test the hypothesis, but has omitted some important variables.. Identifies and addresses some safety /ethical issues. appropriately acknowledged Presents experiment and Sci Journal on time. References are, criteria sheet attached.	Uses data to answer questions about organisms' responses to the environment.	

<p>3. Develop skills and processes to collect, organise, interpret and present primary data (results, bibliography)</p>	<p>Collects and organises data to identify trends and interrelationships. The manipulation (eg averages) and presentation of data (graphs and tables) are complete and clearly provided with headings, labelled axis and units. Thorough descriptions, including table headings accompany the results.</p>	<p>Collects and organises data to identify trends. The manipulation (eg averages) and presentation of data (graphs and tables) are mostly provided with headings, labelled axis and units. Descriptions, including table headings accompany the results.</p>	<p>Collects and organises data. The data (graphs and tables) are generally provided with headings, labelled axis and units.</p>		
<p>4. Analyse data gathered from investigations. (Discussion)</p>	<p>Interprets and critically analyses the results and links this to theoretical concepts, to draw conclusions relating to the research question and background research (introduction). Clear evidence of relevant data interpretation is provided using figures gathered from the investigation to identify patterns or trends. Has honestly assessed the reliability of their results, giving an explanation of the assessment. Possible errors or weaknesses in the design are identified and discussed. Suggestions for further research are provided.</p>	<p>Interprets the results and draws conclusions relating to the research question and background research (introduction). Clear evidence of relevant data interpretation is provided to illustrate patterns or trends. Has assessed the reliability of their results, giving some explanation for this assessment. Possible errors or weaknesses in the design are identified and suggests some improvements.</p>	<p>Discuss the results and draws conclusions that may relate to the research question and background research (introduction). Evidence of relevant data interpretation is provided to illustrate patterns or trends. Has reflected on the reliability of their assessment but has not given enough explanation for their assessment. Possible errors are identified, and suggest a few improvements.</p>		
<p>5. Make judgements and draw conclusions pertaining to the validity of an investigation. (Conclusion)</p>	<p>The discussion relates to the hypothesis and Evaluates the design of the experiment and reflects on the adequacy of data collection and proposed refinements</p>	<p>Evaluates the designs of the experiment and the adequacy of the data collected</p>	<p>Discussing results and draws conclusions</p>		