



Plankton Investigation



Background

Plankton refers to drifting organisms that live in water and lack effective mobility, including phytoplankton and zooplankton. Some plankton have the ability to swim, but their swimming speed tends to be slower than the current flow rate of the ocean current, so they cannot effectively swim in the water. Most planktons are small, but they have important ecological roles in the ecosystem.

Course Objectives

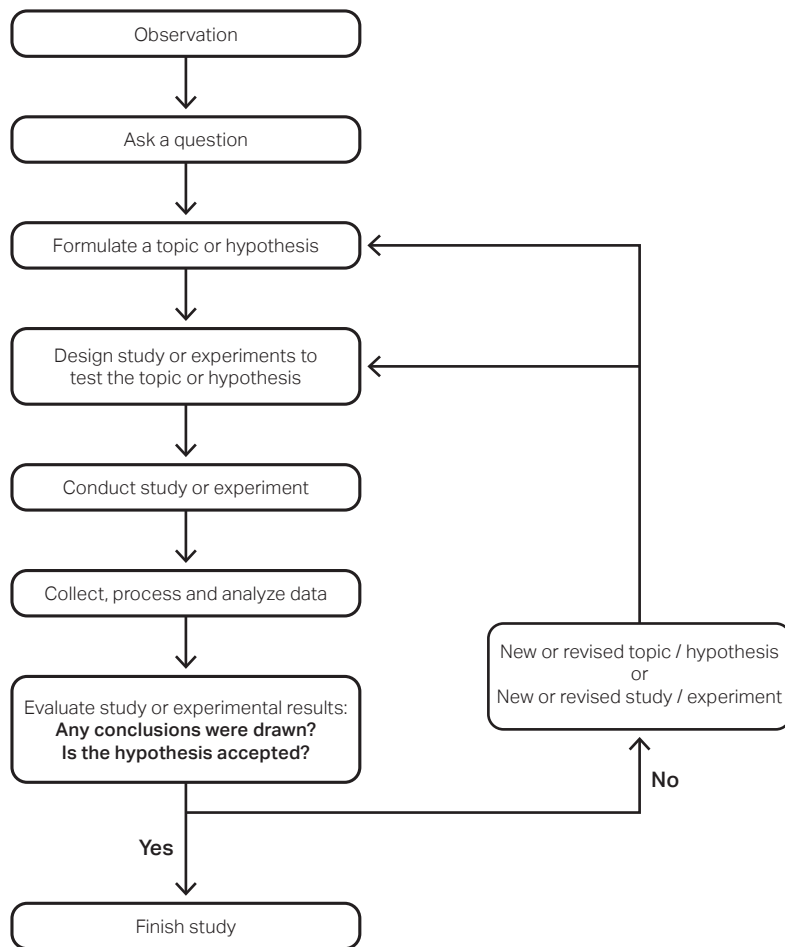
- Study of plankton, design and making of plankton net.
- Use the microscope to find and identify plankton.
- Learn the interaction between biotic community and abiotic factors in the ecosystem.
- Collect quantitative and qualitative data and analyze the data to make conclusions.
- Cultivate scientific inquiry thinking skill and creativity.

Equipment and Apparatus

For plankton net		For experiment	
<input type="checkbox"/> Plastic bottle or any other container	x2	<input type="checkbox"/> Light meter	x1 (if needed)
<input type="checkbox"/> Cloths of different mesh sizes		<input type="checkbox"/> Thermometer	x1 (if needed)
<input type="checkbox"/> Wire adhesive tape		<input type="checkbox"/> Refractometer	x1 (if needed)
<input type="checkbox"/> Scissors	x2	<input type="checkbox"/> Dissolved oxygen meter	x1 (if needed)
<input type="checkbox"/> Needle and thread		<input type="checkbox"/> Spectrophotometer and required chemicals	(Share)
<input type="checkbox"/> Ruler	x2	<input type="checkbox"/> Pipette	x2
<input type="checkbox"/> Rope		<input type="checkbox"/> Microscope	x2
<input type="checkbox"/> Rubber band		<input type="checkbox"/> Slide	
<input type="checkbox"/> Oil color pen	(Depend on design)	<input type="checkbox"/> Cover slip	
<input type="checkbox"/> Cellophane paper	(Depend on design)		
<input type="checkbox"/> Fluorescent stick	(Depend on design)		
<input type="checkbox"/> Flashlight	(Depend on design)		
<input type="checkbox"/> Compact bag	(Depend on design)		
<input type="checkbox"/> Weight	(Depend on design)		
		Others	
		<input type="checkbox"/> Plankton Identification kit	x2
		<input type="checkbox"/> Plankton count slide	x1
		<input type="checkbox"/> Microscope eyepieces and mobile phone lens adapters	x1

1

Investigation Flowchart



2

Investigation Guideline

Students should list:

1. Observation: Are there any special phenomena or trends observed? If so, try to describe it.
For example: the distribution, quantity or behavior of organisms
2. Ask a question:
For Example: a) Why is this phenomenon or trend occurring? (Hypothesis is required)
b) How does abiotic factor X affect the distribution, abundance or behavior of organism Y?
(Hypothesis is not required)
3. Formulate a topic or hypothesis: What is the question?
(Hint: It must be clearly defined, measurable and manipulated)
4. Design and conduct study or experiments → Design and making of plankton nets and experiments
 - a) Identify what data need to be collected, such as: independent variable, dependent variable, and control variables.
 - b) How to design plankton nets to collect the data needed for analysis, such as abiotic factors and biotic factors?
 - c) How to measure data? What apparatus are needed?
 - d) How many times does each data need to be measured?
5. Data analysis
 - a) How to process and present the data?
 - b) How to analyze the data so as to make a conclusion?

PROPOSAL OF STUDY METHODS

1

Problem,
Hypothesis
and Prediction

Why _____ ?

Hypothesis A:
Because...

Hypothesis B:
Because...

Prediction: If hypothesis A is correct, I will observe the following:
When X: _____, Y will _____
_____ in organism Z.

Will this observation support other hypotheses?

OR

How X: _____ affects Y: _____ in organism Z: _____ ?

Prediction:
When X: _____, Y will _____
_____ in organism Z.

Explain the theory supporting your prediction.

PROPOSAL OF STUDY METHODS

2

Variables Identification and its Manipulations

Independent variable X

How to change and measure X
Need repeated measures? How?
Is it the best way to measure X? Any other ways?

Dependent variable Y

How to change and measure Y
Need repeated measures? How?
Is it the best way to measure Y? Any other ways?

Other variables that will significantly affect Z (other than X)

Variables	How it affects Z	Will you control this variable? If yes, how to make them the same between different setup/ trials? If not, why?

How to make sure the individuals or the parts you study are representative?

--

PROPOSAL OF STUDY METHODS

3

Experimental Design

Making of plankton net

Apparatus and its quantity

Procedures in brief

- 1.
- 2.

Setup diagram(s)

Laboratory work

Apparatus and its quantity

Procedures in brief

- 1.
- 2.

Setup diagram(s)

4

Data
Collection

Draw a result table to record raw data (with appropriate title)

PROPOSAL OF STUDY METHODS

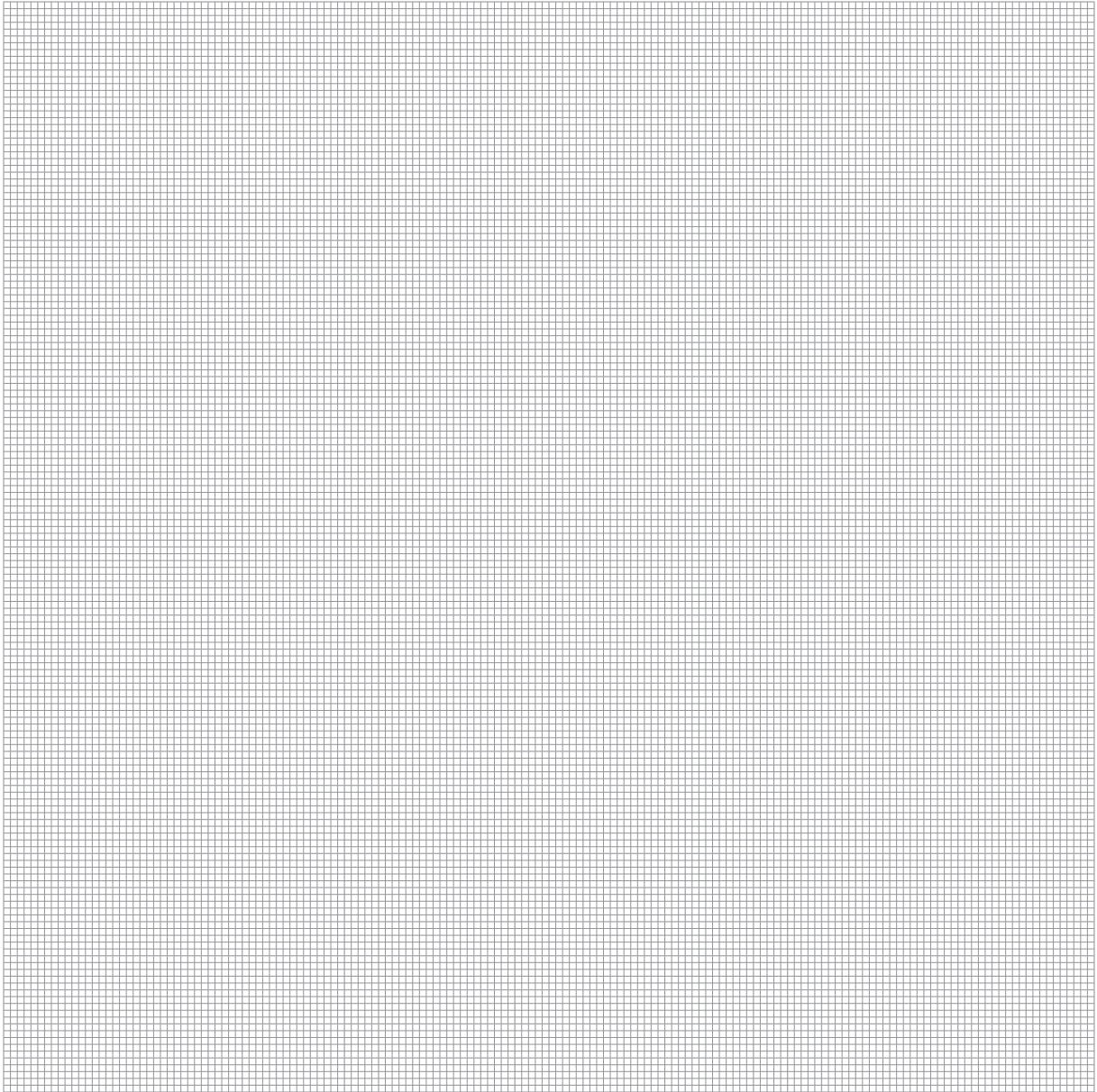
5

Data
processing
and
presentation

Finish the following before preparation of your presentation:

Draw a result table to record raw and processed data (with appropriate title)

Draw an appropriate graph to address the topic (with appropriate title).



Plankton Investigation
CONCLUSION

Results: Relationship between X and Y as shown by the data/graph

Is your prediction correct?
 If not, is the theory supporting your prediction wrong?
 Or the data support other hypothesis instead?

Can the relationship be applies to all organism Z?
 Explain why and suggest how to improve.

Evaluate the investigation's

1. Reliability → Is your data reliable, repeatable and consistent?
2. Validity → How well did your data address the research aim? (i.e. what it is supposed to measure)

Errors/Uncertainties/ Biases/limitations	How it affects reliability / validity?	Improvements

Conclusion: After taking into account all of the above, to what extent do you think the relationship shown by the data is true for organism Z?

(It can be supported / refuted / remains undetermined)

Are there any needs for further experiments or investigations?