Biology

The importance of reasoning and argumentation in laboratory reports.

At the end of the lesson students should be able to:

- Follow a step by step approach (CER) to gather evidence from careful observation/findings.
- Make a claim (background information) to support their observation/findings.
- Deduce a reason and make correlations between the evidence and claim.

Students will carry out the experiment on Osmosis. The main focus for today's session will be *Reasoning*

Aim: To investigate osmosis in potatoes.

Background Information: Students will be instructed to gather the necessary information the day before the lab experiment.

Hypothesis to be tested:

Cells when placed in an environment of high solute concentration will decrease in mass due to water moving from inside the cell (less solute concentrated) to to the high solute concentration.

Apparatus/Materials:

a piece of potato, a scalpel, a white tile, two test tubes, a strong salt
solution, distilled water, access to a balance.

Procedure:

1. Label one test tube 'salt solution' and the other 'distilled water'
2. Half-filled each with the correct liquid.
3. On the white tile, trim two pieces of potatoes to the same size (about 5cm x 1cm x 1cm).
Roll them on paper towels to dry the surface.
4. Weigh each and make a note of the mass in a table like the one shown.
5. Place one piece of potato in each test tube.
6. Leave for 30 minutes.

While students wait. They will gather the necessary information needed for the experiment on Osmosis.

They will then be introduced to (CER) via youtube link
https://www.youtube.com/watch?v=5KKsLuRPsvU.

7. Remove the pieces of potato and roll them on a paper towel to dry the surface.
8. Re-weigh the pieces of potato and make a note of their masses.
9. Calculate the changes in mass.

Students will then set up a table shown below.

	Salt Solution	Distilled Water
Initial Mass in Grams		
Final Mass in Grams		
Change in Mass in Grams		

10. Explain your results using the ideas of water gain or water loss by osmosis

Students will follow a flow chart and will practice using (CER) before proceeding to writing their final report.

Students will be instructed to state their evidence before making their claim/background information. And they will be asked to think about this question as they practice their reasoning using the CER table.

Question: How can we prove that water molecules move from an environment of high concentration to an environment of lower concentration across a semipermeable membrane until equilibrium.

STEP 1

Evidence/Observation	Evidence/observation

STEP2

Claim	

STEP 3

Reasoning	

ATthe end of this activity students will be asked to complete their lab report.

Biology
Second session will shown the difference of *argumentation* and *reasoning*
- Students will be asked to reflect on the previous lesson on CER
- Students will be introduced to a similar process of osmosis which is **Diffusion.**

A similar model from the BioGraph course will be used for assessing argumentation.

Group Discussion;
Osmosis: Osmosis is the movement of solvent particles across a semipermeable membrane from a dilute solution into a concentrated solution. The solvent moves to dilute the concentrated solution and equalize the concentration on both sides of the membrane.

Diffusion: Diffusion is the movement of particles from an area of higher concentration to lower concentration. The overall effect is to equalize concentration throughout the medium.

It can be argued that Diffusion is the same as Osmosis because they both involve the movement of particles or molecules from a high concentration to a low concentration. But there is evidence to support that Osmosis is not the same as Diffusion. **Students will select which of the claims they agree with.**

Claim A. Diffusion and Osmosis are the same because they both are passive transport processes.

Claim B. Osmosis is not the same as Diffusion because osmosis only involves the movement of a solvent.

State your Evidence...

State your reasons...

Students will be placed into groups and will be given necessary background information to help in their discussions and presentation.

The argumentation rubric will be used to assess each group at the end of their presentations.

Argumentation Rubric

Level	Relevance (Does your evidence support your claim?)	Sufficiency (Do you have enough evidence?)	Connecting Reasoning (Do you connect your claim to your evidence?)	Science Ideas (Do you use science ideas to justify your evidence?)
1	Student does not provide evidence supporting the claim.	Student provides no evidence (observations or measurements).	Student does not provide any connections between their evidence and the claim.	Student provides no science ideas or science ideas provided are incorrect.
2	Student provides a mixture of supporting evidence as well as non-supporting evidence to support the claim.	Student provides one piece of evidence (observations or measurements) *but more evidence is needed to support the claim.*	Student connects some, but not all evidence to the claim.	Student provides some correct science ideas that are *not* relevant to the claim.
3	Student provides mostly supporting evidence which supports the claim.	Student provides one piece of evidence (observations or measurements) to support the claim.	Student connects all of the evidence to the claim but the connections are vague or insufficient	Student provides a relevant science concept or term, but does not explain it and how it relates to the claim.
4	Student limits all of the evidence to that which is relevant to the science in the claim and supports the relationship in the claim.	Student provides at least two pieces of evidence that fully support the claim.	Student connects all of the evidence to the claim sufficiently and clearly	Student provides a relevant science concept that is correctly explained.