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# PROJECT BASED LEARNING: ALIGNING WITH CURRICULUM STANDARDS

# PRESENTED BY MULUMBA MUTEMA MATHIAS

## CURRICULUM SPECIALIST

# AGENDA

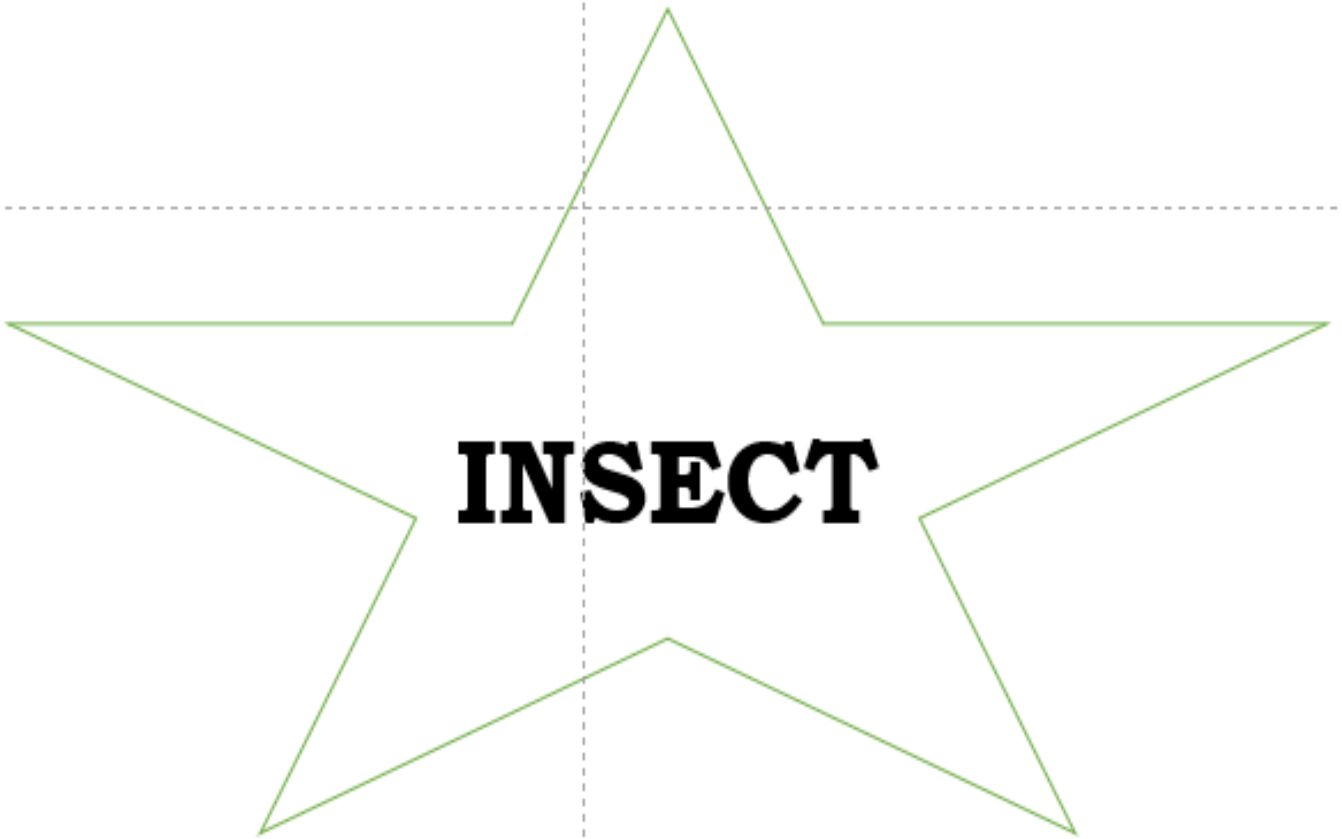
1.Introduction to project-based learning

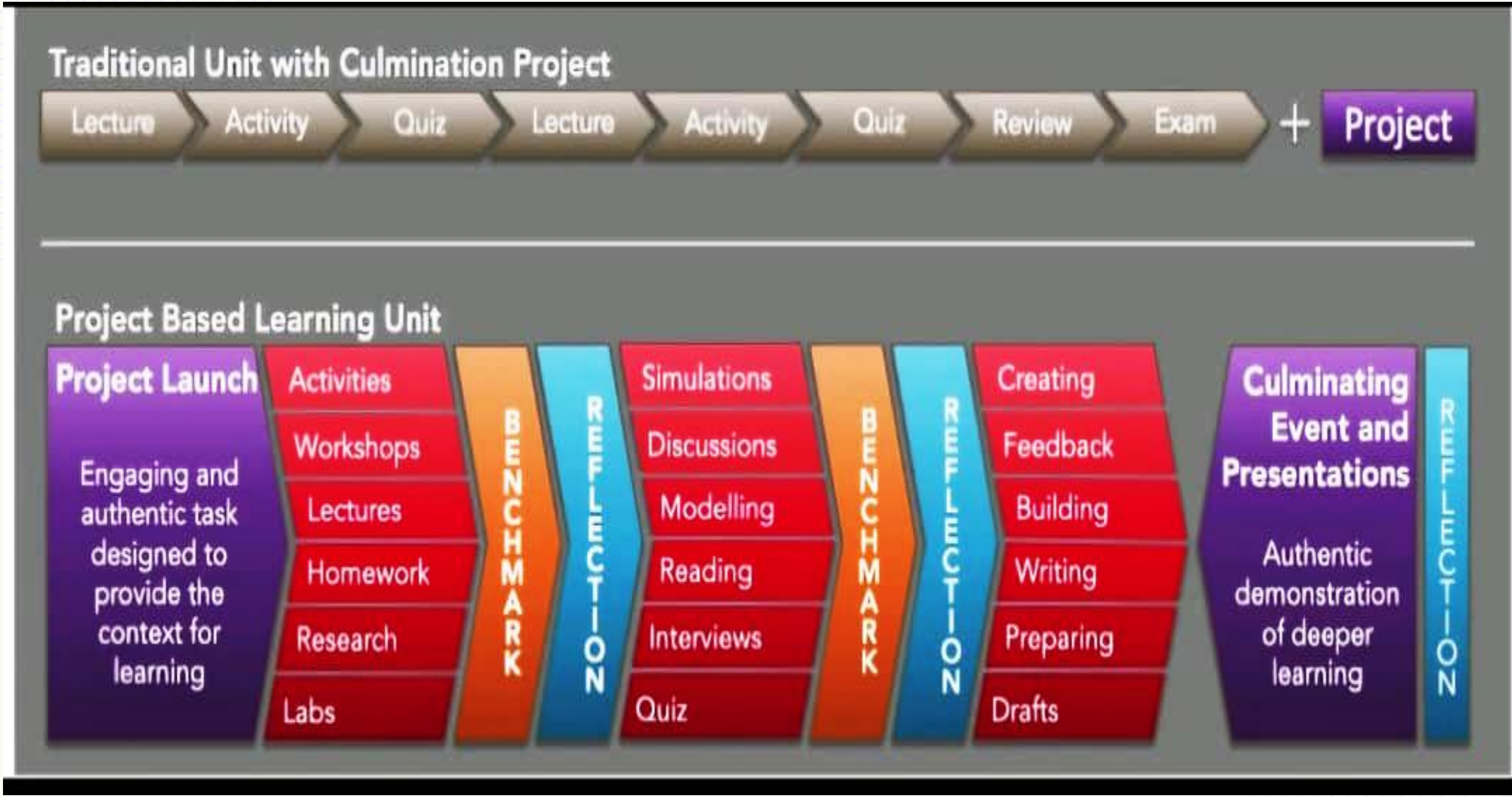
2.Aligning to teaching syllabus and curriculum standards

3.Facilitating a project-based learning task

4.Final  takeaways

# WHAT COMES TO YOUR MIND WHEN YOU READ THE STATEMENT IN THE BUBBLE




Traditional Unit with Culmination Project
Lecture
Activity
Quiz
Lecture
Activity
Quiz
Review
Exam
+
Project
Project Based Learning Unit
Project Launch
Engaging and authentic task designed to provide the context for learning
Activities
Workshops
Lectures
Homework
Research
Labs
BENCHMARK
REFLECTION
Simulations
Discussions
Modelling
Reading
Interviews
Quiz
BENCHMARK
REFLECTION
Creating
Feedback
Building
Writing
Preparing
Drafts
Culminating Event and Presentations
Authentic demonstration of deeper learning
REFLECTION

# Deeper Learning

Deeper learning develops students' abilities to think critically and solve complex problems, communicate effectively, work collaboratively, and learn independently. The teaching approaches that support deeper learning enable students to succeed and thrive in an ever-evolving and interconnected society. Curriculum, instruction, and assessment focused on deeper learning engage students ir

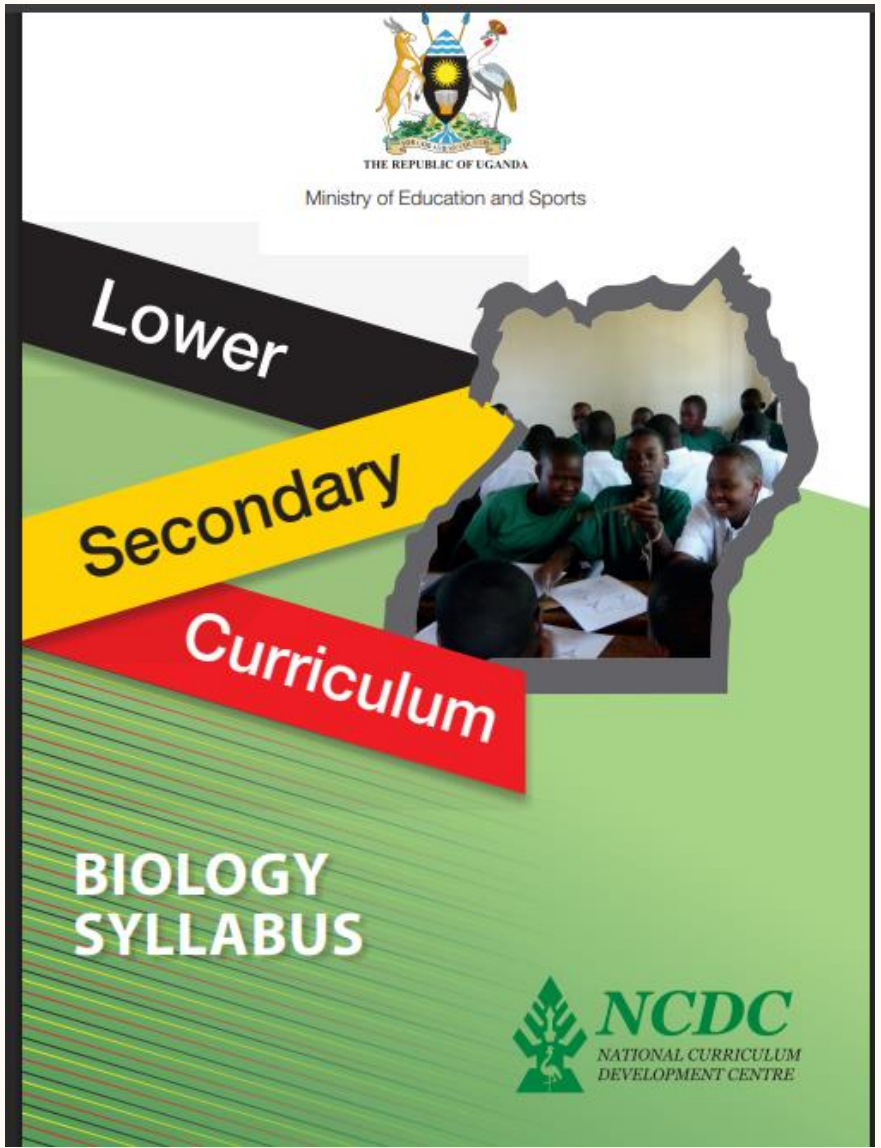
# HOW DO YOU INTERACT AS A FACILITATOR OF PROJECT BASED LEARNING FOR DEEPER LEARNING



- USING AND APPLING LEARNER CENTRED APPROACH DURING TEACHING AND LEARNING
- YOU ARE PREPARING LEARNERS FOR PROJECT BASED LEARNING AND PROJECTS
- HOW DOES THE PROJECT MANIFEST/UNFOLD IN REAL LIFE
- YOU NOW CREATE AN OVERARCHING QUESTION TO HELP LEARNERS DEVELOP DEEPER UNDERSTANDING

# ALIGNING WITH CURRICULUM STANDARDS








**SENIOR 1: TERM 3** **Theme: Diversity of living things**

**TOPIC: INSECTS** **20 PERIODS**

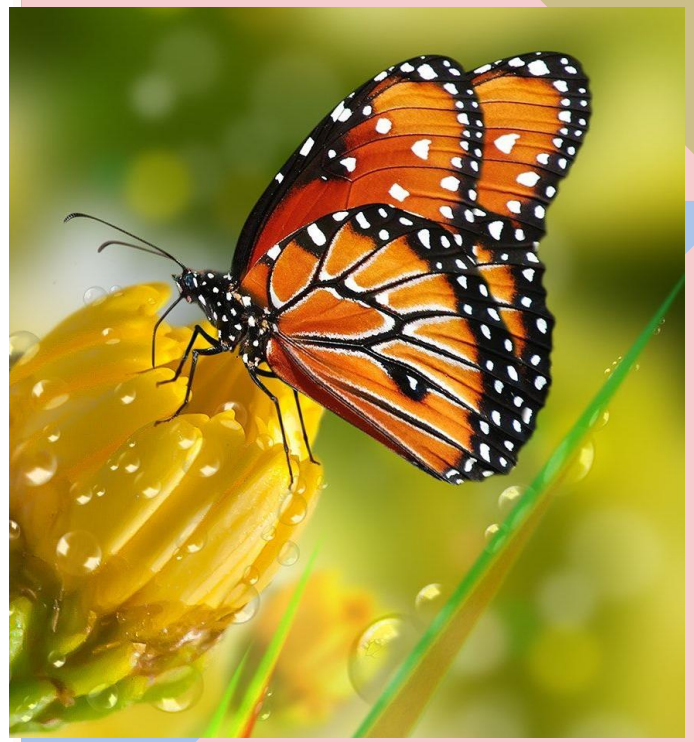
**Competency:** The learner should understand the characteristics of insects and relate structures to their functions in some common insects, and appreciate that insects have a direct or indirect effect on the well-being of other organisms.

| LEARNING OUTCOMES<br>The learner should be able to: | SUGGESTED LEARNING ACTIVITIES | SAMPLE ASSESSMENT STRATEGY |
|---|---|---|
| a) identify the observable external features of a housefly, cockroach, mosquito, termite, bee and butterfly (No details of mouth parts required) (k, s)<br>b) construct a dichotomous key (s)<br>c) appreciate the useful and harmful effects of a housefly, cockroach, mosquito, bee and butterfly (u)<br>d) know the different methods of controlling the harmful stages of a housefly, cockroach, mosquito and some butterflies (u) | • In pairs, use a hand lens to observe a housefly, cockroach, mosquito, termite, bee and butterfly paying specific attention to the following structures:<br>  • head (mouth parts, antennae, eyes, hair)<br>  • thorax (wings, halters, hairs, strips, legs and the different segments)<br>  • abdomen<br>• Pairs create a suitable table and record observations comparing each of the insects<br>• Draw the insects provided, label the structures listed above and annotate drawings to explain the functions of the structures<br>• Pairs construct a dichotomous key for any four of the insects listed above<br>• Pairs research different methods of controlling the harmful stages of a housefly, cockroach, mosquito and some butterflies, and produce a presentation advising the class how to control these populations | • Observe pairs carrying out activities and check they identify the parts listed; create an appropriate comparison table; draw and label correctly; construct keys that work<br>• Listen to pairs' conversations and monitor understanding and progress towards learning outcomes<br>• Evaluate quality of products of each activity |

**ICT Support**

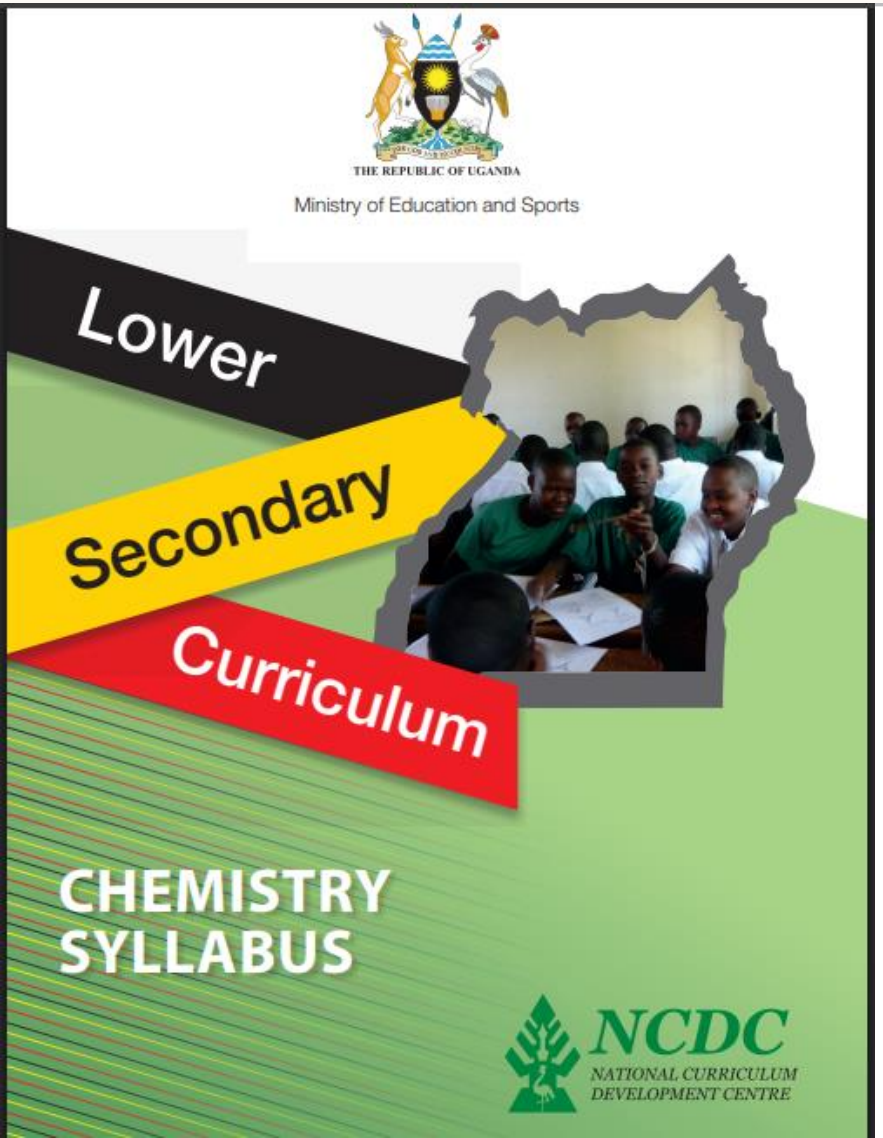
- The learner can use a suitable graphical program to present the dichotomous key.

**Note:** For the life cycles of each of the insects, only give duration of the whole cycle, not duration for each stage of the cycle.



# ALIGNING WITH CURRICULUM STANDARDS



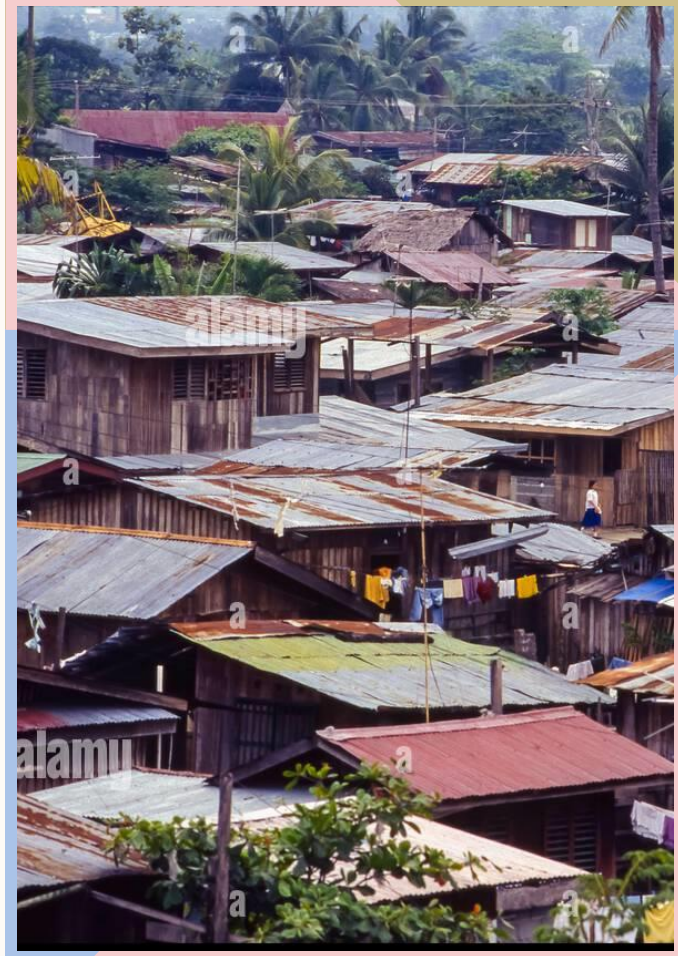



**SENIOR 4: TERM 1** **Theme: REDOX Reactions**

**TOPIC: OXIDATION AND REDUCTION REACTIONS** **18 PERIODS**

**Competency:** The learner understands oxidation and reduction in terms of gain or loss of oxygen and in terms of electron transfer, and he/she appreciates that the two processes always occur together.

| LEARNING OUTCOMES<br>The learner should be able to: | SUGGESTED LEARNING ACTIVITIES | SAMPLE ASSESSMENT STRATEGY |
|---|---|---|
| a. understand the processes of oxidation and reduction and their importance in the chemical industry (u, s)<br>b. explain redox reactions in terms of electron transfer (u)<br>c. understand the changes that take place during the electrolysis of some compounds (u, s) | • In groups, learners research, explain and report on the terms: 'oxidation' and 'reduction' in terms of:<br>  • loss or gain of oxygen<br>  • loss or gain of hydrogen<br>  • transfer of electrons<br>  • change in oxidation number<br>Individuals then calculate the oxidation number of an element in a compound.<br>• In groups, learners:<br>  • collect and interpret data on the existence of various ores in Uganda and<br>  • produce a chart to explain the contribution of metal extraction to the Ugandan economy<br>  • explain the relevance of reduction/ oxidation to metal extraction<br>• In groups, learners plan, investigate and report on oxidation and reduction in a selection of reactions, writing ionic equations and explaining reactions in terms of electron transfer<br>• Groups discuss electrolysis and produce illustrations to explain:<br>  • the meaning of electrolyte<br>  • moving ions and electrical conductivity<br>• Groups use carbon electrodes in the electrolysis of copper (II) sulphate solution and dilute sulphuric acid and:<br>  • identify cations and anions in the aqueous solutions<br>  • describe the electrolysis of the aqueous solutions<br>  • write half equations for the discharge of ions at the anode and the cathode | • Listen to group discussions and intervene appropriately to check understanding of oxidation and reduction, especially in terms of electron transfer. Pose questions to check understanding of electrolytes and electrolysis in terms of discharge at the electrodes.<br>• Observe groups engaged in activities and offer guidance to deepen learning.<br>• Evaluate quality of learning through assessment of products: presentations about chemical change and equations to determine progress towards the Learning Outcomes. |



# INTERACTING WITH A VIDEO CLIP TO LAUNCH A TASK



PLAY VIDEO

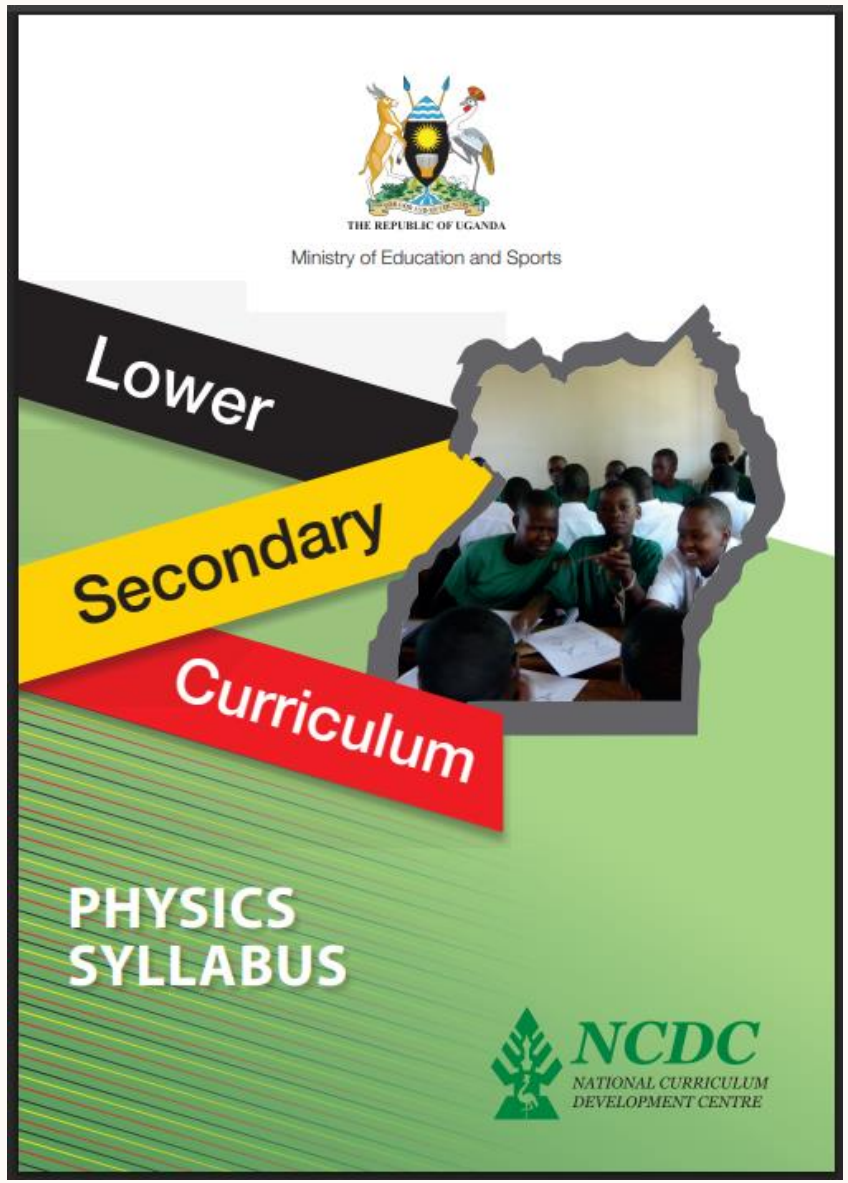
?

# HOW CAN WE PRODUCE FRESH FOOD THAT ARE INTACT IN FORM AFTER CUTTING THEM IN OUR COMMUNITY

# HOW CAN WE MAXIMIZE OUR MONEY AT LUNCH IN OUR COMMUNITY

# ALIGNING WITH CURRICULUM STANDARDS






PHYSICS SYLLABUS

**SENIOR 1: TERM 3** **Theme: Heat**

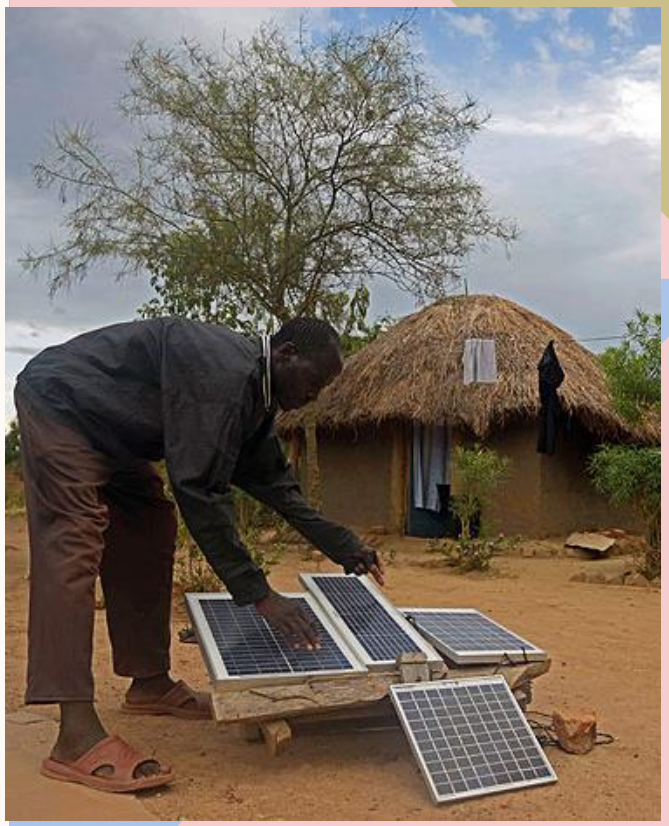
**TOPIC: FORMS AND SOURCES OF ENERGY AND MEASURING HEAT** **10 PERIODS**

**Competency:** Appreciate that the sun is the major source of our energy, which can be changed from one form to another, and that the sun's energy has both positive and negative effects.

| LEARNING OUTCOMES<br>The learner should be able to: | SUGGESTED LEARNING ACTIVITIES | SAMPLE ASSESSMENT STRATEGY |
|---|---|---|
| a. know the sun is our major source of energy, and the different forms of energy (k)<br>b. know that energy can be changed from one form into another and understand the law of conservation of energy (k, u)<br>c. be able to measure temperature and understand the relationship between heat and temperature (s, u)<br>d. understand the positive and negative effects of solar energy(u) | • In pairs, learners explain on a poster<br>  ▪ how the sun is the Earth's major source of energy<br>  ▪ why there are daily changes in the air temperature<br>  ▪ why, during energy changes, the total energy remains unchanged<br>• In groups, learners draw on prior learning to discuss and explain the energy transformations that take place:<br>  ▪ at a waterfall<br>  ▪ when a diesel generator is used to provide light and heat<br>  ▪ when fruit falls to the ground from a tree<br>• In pairs, learners research the law of conservation of energy and explain it on a poster.<br>• In groups learners draw on prior learning about how thermometers measure heat energy and compare the accuracy of mercury, alcohol and digital thermometers as water is heated and/or cooled.<br>• In groups, learners plan and report on an investigation into the thermometric qualities of liquids, calibrating their experimental thermometers and evaluating the accuracy of the calibration<br>• In groups, learners research and report on the positive and negative impact of solar energy. | • Listen to discussion in groups and pairs and pose questions to encourage thinking to understand that energy can neither be created nor destroyed, only transformed from one type to another.<br>• Observe how learners participate in group and pair work, ensuring all participate and make progress.<br>• Assess the quality of products and scientific literacy, and then evaluate progress towards the learning outcomes. |

**Note:**
Gas and resistance thermometers should not to be discussed at this level

**ICT Support**
- use any computer program to draw a flow chart showing the various energy changes
- use data collection tools such as a temperature probe (sensor) to capture the temperature heat variation



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# HOW CAN WE BAKE FOOD USING SUNLIGHT IN OUR COMMUNITY

**COMPETENCY: appreciate that the sun is the major source of our energy, which can be changed from one form to another, and that the sun's energy has both positive and negative effects.**

- **Learning outcome**

a. know the sun is our major source of energy, and the different forms of energy (k)

b. know that energy can be changed from one form into another and understand the law of conservation of energy (k, u)

c. be able to measure temperature and understand the relationship between heat and temperature (s, u)

d. understand the positive and negative effects of solar energy(u)

- **Suggested learning activity**

In pairs, learners explain on a poster • how the sun is the Earth's major source of energy • why there are daily changes in the air temperature • why, during energy changes, the total energy remains unchanged

**Competency:**

The learner should investigate how some objects emit light resulting in light and shade, while other objects, such as a mirror, simply reflect light, and understand the applications of light/shade and reflection

| LEARNING OUTCOMES<br>The learner should be able to: | SUGGESTED LEARNING ACTIVITIES | SAMPLE ASSESSMENT STRATEGY |
|---|---|---|
| a. identify illuminated and light source objects in everyday life (u, s)<br>b. understand how shadows are formed (u)<br>c. understand how the reflection of light from plane surfaces occurs and how we can make use of this (u, s) | • In groups, learners brainstorm prior learning about natural and artificial sources of light and the formation of shadows, and explain using diagrams.<br>• In pairs, learners apply prior learning to investigations of a pinhole camera and use it to explain magnification and image, using diagrams.<br>• In pairs, learners investigate the characteristics of images formed by plane mirrors and research and explain angles of incidence and reflection, recording findings with (ray) diagrams.<br>• **In pairs, learners apply their knowledge of reflection to design, make and report on a device (periscope) using card and mirrors which would allow a person to see over a wall.**<br>• In pairs, learners use their knowledge about how light travels to explain in diagrams how light from the sun reaches the Earth and how eclipses are formed | Listen to pair discussions and intervene to ensure diagrams are drawn accurately and that they use them to explain the nature of light, the formation of shadows and the pinhole camera.<br>• Observe pairs and groups engaged in practical activities and intervene to ensure investigations are well planned and conducted and misconceptions are avoided.<br>• Evaluate learning through products: diagrams and designs; assess progress towards the learning outcomes. |

# REAL -LIFE SITUATION



- **Some people in our community cannot see objects that are at a distance or behind the wall yet there is a window.**
- What plan do you have for them as you study the nature of light; reflection of light at plane surfaces. Explain why your plan is needed? How will your plan to help these people? Why is it the best thing you can do for them?
- What will you need to help them? What will be the use of each? How will you get those materials? How will you ensure that you succeed in helping them

# READING EXTRACT TO LAUNCH A TASK



- During the manufacture of engine parts, a lot of care is taken. This is  to make sure that metal surfaces which have to slide or rotate in contact with each other are finished as smoothly as possible. However, the surfaces are never completely smooth. On close observation of these surfaces, they may look or feel smooth. The surfaces will show roughness when examined under a microscope.
- If two such surfaces are rubbed together, they will get hot. The heat you have is caused by particles touching each other. In fact, if they have enough pressure applied and they are rubbed fast enough together they will eventually become hot enough. They will melt on the surface and weld together. This is similar to when you rub your hands smartly back and forth across a table surface

# VISITORS DETECTOR IN OUR HOMES

A periscope allows you to look over at objects or people from around a corner, or from a higher vantage point than normal. While modern submarines and other high-tech vehicles usually use a more complex system of prisms and lenses, the basic mirror periscope described below is easy to make at home, and provides a clear enough image that it was widely used for military purposes well into the twentieth century

# DRIVING QUESTION:
# How can we produce durable product with surface that rub against each other in our community

## MATERIALS COME INTO CONTACT OR TOUCH EACH OTHER: WHAT HAPPEN

# USE SOCRATIC DIALOGUE FOR SUSTAINED INQUIRY



Engage the learners in a brainstorming session, including:

Mind mapping

KWL chart, to gather initial thoughts, ideas, and prior knowledge related to inferred from the driving question.

Following the brainstorming, provide time for individual or group carry out investigations

# PLAN, INVESTIGATE AND DESIGN THE ACTIVITIES



## Complete a business model canvas

# Business Model Canvas

**Key Parnters**

Help build or deliver the product to users

**Key Activities**

What you need to do to build and deliver the product

**Key Resources**

Things that you need to build the product

**Value Proposition**

Why people would want your product

**Customer Relationships**

How you build relationships

**Channels**

How you get the product to customers

**Customer Segments**

Different types of customers

**Cost Structure**

Cost of building the product

**Revenue Stream**

How you get money from customers

# PLAN, INVESTIGATE AND DESIGN THE ACTIVITIES

1. Instruct and encourage learners to have time and materials, tools, equipment, and inputs to implement their values preposition proposals. Encourage them to collaborate, seek external expertise, interact with adults outside the classroom, and use various methods to control invasive populations effectively. Learners should document their process with photographs, videos, or written reflections and include them in a portfolio.

2. Guide learners in developing a public product that showcases their efforts to control invasive populations for farmers. This product could be a brochure, a website, a video documentary, or an educational poster/leaflet/banner/factsheet. The public product should be engaging, clearly communicate the value preposition outcomes, and aim to educate the broader community on the issue.

# DOCUMENT AND EXHIBIT THE PUBLIC PRODUCT

# PREPARE A REPORT



**Project-Based Learning Report**

**Project Title:**

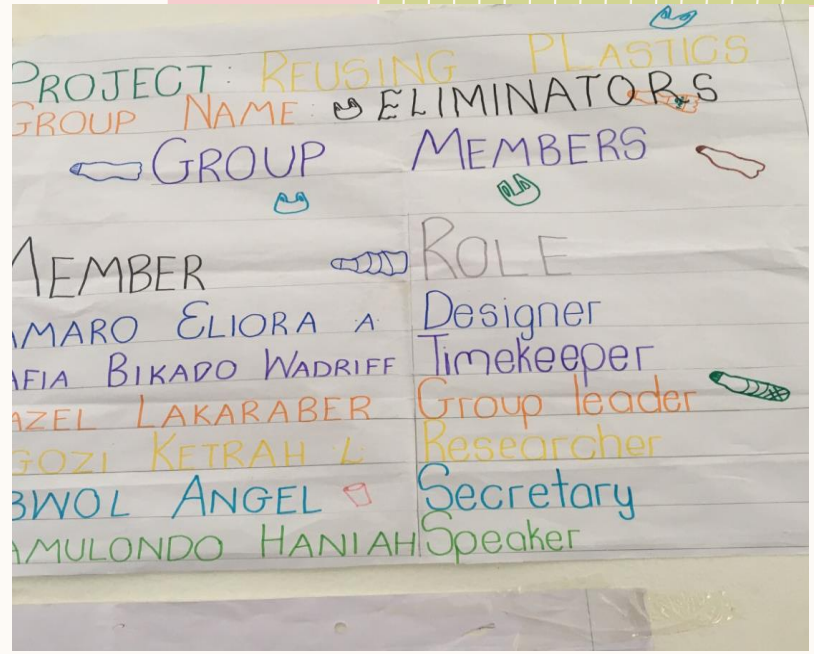
*“ Building a Thriving Garden for Bees, Butterflies, and Beyond”*

**Project Team:**

- [Insert Team/Group Member Names]
- Community Participants: [List Key Contributors]

**Project Duration:**

[Insert Start Dates and End Dates]



# INTRODUCTION

Pollinators help plants grow and thrive. Pollinators are organisms that include bees, butterflies, and hummingbirds. These play a crucial role in our lives. They support plant reproduction, food production, and ecosystem balance. Their numbers drop due to habitat loss. This is to say environmental threats have led to a decline in pollinator populations. This project aimed to design and establish a **pollinator-friendly garden. It created a habitat** that attracts and supports these vital creatures. In turn the garden would benefit both the environment and our local community.

# PROJECT BASED LEARNING GOALS AND OUTCOMES

1. Investigate/find out the native plants and flowers that attract pollinators.
2. Develop a sustainable garden layout incorporating food, water, and shelter for pollinators.
3. Plant flowering plants,
4. Install pollinator nesting areas
5. Create water sources.
6. Educate the public about the importance of pollinators through workshops and signage.
7. Track pollinator visits and ensure ongoing care for the garden.

# PROJECT BASED LEARNING TASK ACTIVITIES

**Step 1: Project based learning task Launch, Investigation and Planning**

**Step 2: Designing the Garden**

**Step 3: Implementation**

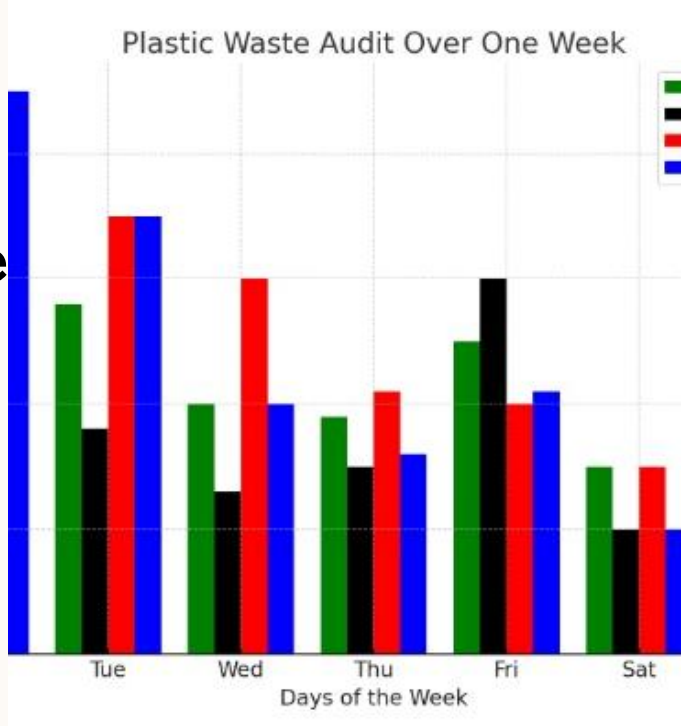
**Step 4: Community Involvement**

**Step 5: Results, Reflection and Impact**

**Step 6: Challenges and how did you over come the**

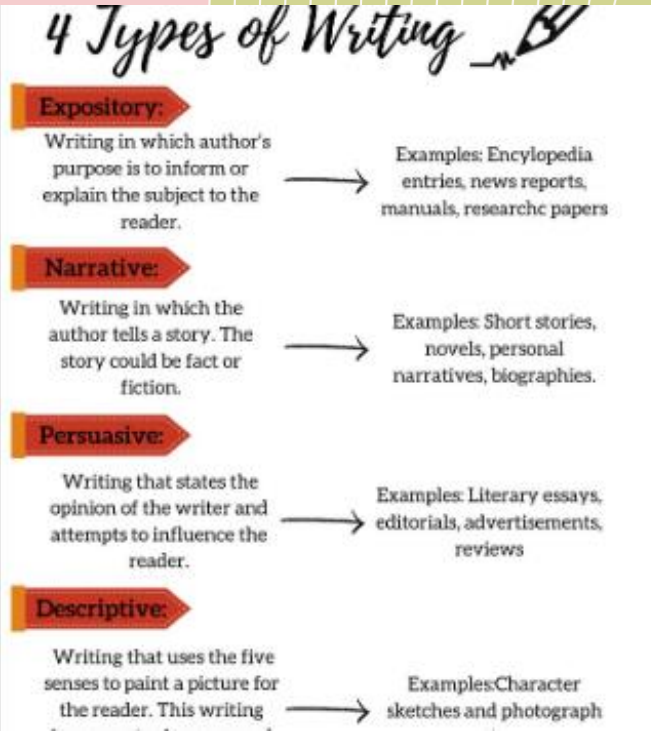
**Step 7: Exhibition, Conclusion and Next Steps**

**Step 8: Recommendations and Conclusion**



# EXAMPLE OF A REFLECTIVE PARAGRAPH

As I carefully select nectar-rich blooms, I become more aware of the delicate balance between plants and pollinators. Watching butterflies flutter from flower to flower, I see firsthand how a simple garden can become a haven for biodiversity. Each choice—the vibrant colors, the fragrant blossoms, the sunlit spaces—shapes an ecosystem that welcomes life. The patience required to nurture these plants mirrors the patience needed to appreciate the beauty of transformation, much like the butterfly itself. In cultivating this space, I realize that small actions can make a big difference, not just for the butterflies, but for the world around us.



# FINAL TIPS AND TAKEAWAYS



In writing a report you need to use

- Sentences

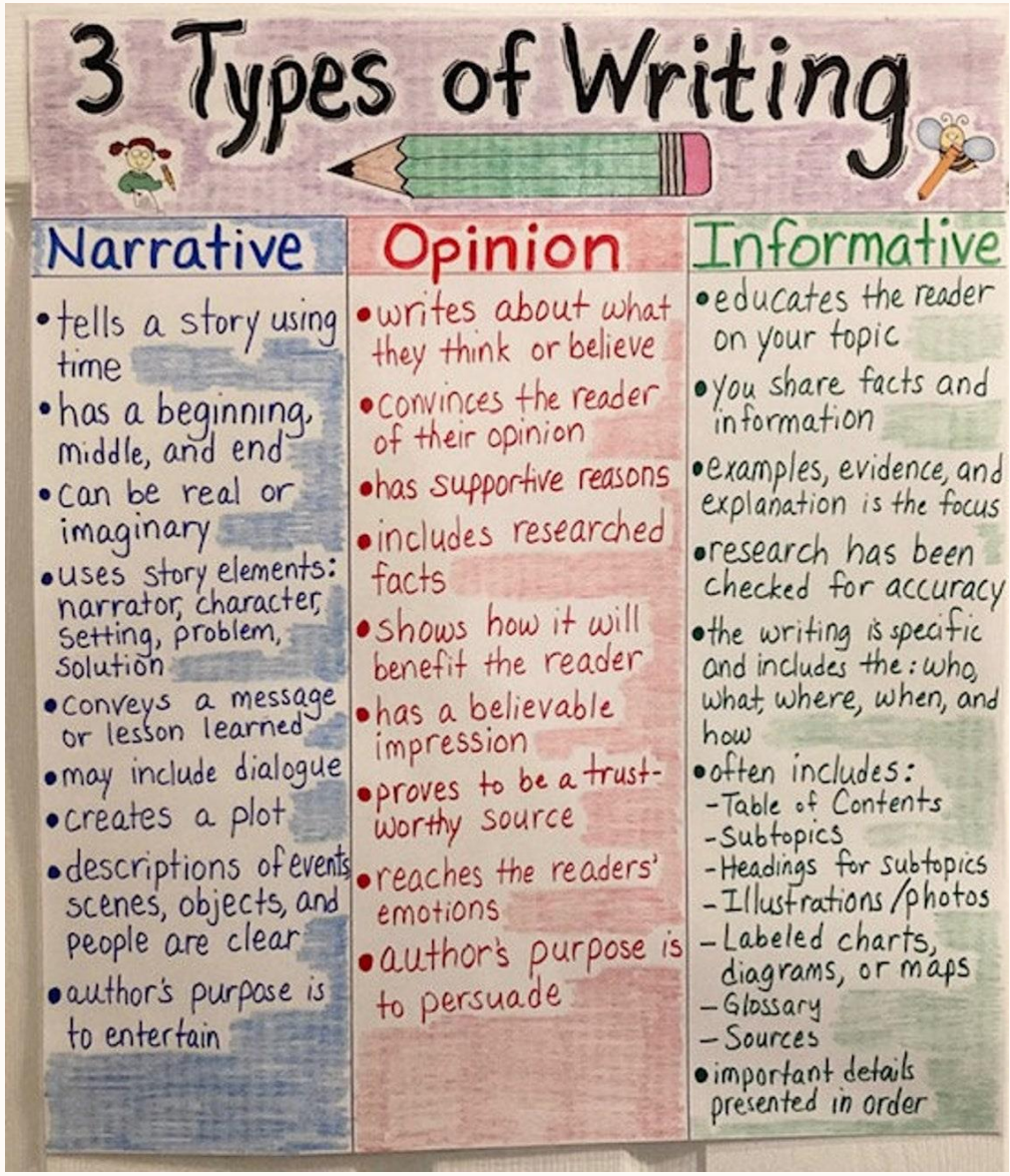
A sentence has object + verb + qualifier or subject + predicate

- Paragraphs
- A paragraph

Has a hook/grabber sentence

Has three or more bridge sentences

Has a wrap up sentence



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# Project Based Learning: ALIGNING WITH CURRICULUM STANDARDS

SPEAKER: **Mulumba Mutema Mathias**

CURRICULUM SPECIALIST, NCDC

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