



Centre for Mathematics Science and Technology Education in Africa
(CEMASTE A)

BIOLOGY INNOVATION

THE CEMASTE A PLACE BASED LEARNING TRAIL

Make Learning Happen Anywhere



Introduction

Good learning should happen ubiquitously. The environment is a rich natural school to facilitate such authentic learning. It has been observed however that the existence of institutions designated as schools, with solid walls to some extent has influenced how learning takes place-confined in buildings to a large extent. On the other hand, an examination of effective learning strategies indicates that learner-centred, experiential active learning offers the best benefits. Such learning enables learners to make relationships between what they learn and their implications to their day to day life. This kind of learning can be classified as authentic learning. The purpose of this booklet is therefore to provide a practical demonstration of how to implement active learning through place-based learning approaches using the learners' immediate environment. It is expected that teachers will be able to replicate similar experiences in their schools and in all subjects.

What is Place-Based Learning (PBL)?

Place-Based Learning (PBL) is an innovative instructional approach that enables student agency, boost access and opportunity, prioritize deeper, experiential and personalized learning by using the learner's immediate environment and communities.

Rationale

PBL connects learning and communities with an aim of increasing students' engagement by exploring real-world problems hence promoting understanding of the world around them. It makes learners appreciate and understand the local places hence fostering a sense of community. The concept can be practised in the context of the school which forms a part of a learner's community.

PBL is suitable in the wake of the COVID-19 pandemic as it provides teachers and learners learning experiences outside the classroom; important towards observing COVID health protocols of social distance.

The School Context

Every school has numerous places where students can visit and learn concepts in all subjects. Such could be the school kitchen, animal husbandry projects (poultry, cattle, and rabbits) , school gardens and forests, rivers, solid waste sites, playfields and the general school compound. Visits to these places could provide biology students with the opportunity to discuss numerous concepts. A visit to a flower bed, for example, could provide the opportunity to learn the structure and functions of flowers without the need to cut them off. A visit to the school kitchen could be used to enhance knowledge on nutrition where learners could ask questions to catering staff or make observations on food preparation as well as the school menu.

The Innovation

This Place-Based Learning innovation is modelled at CEMASTEIA and its compound. It is made up of numerous stations, some natural and other deliberately developed for the purpose of enhancing place-based learning. The walk/trail is divided into 10 stations where learners explore different biological concepts as we move along the path. As learners move along, as guided by the teacher they engage with the resources at various stations and as individuals and in groups respond to activities.

Place-Based Learning enhances learner science process skills in biology. Such skills include observation, drawing, reporting, and communicating science/biological ideas to others, making inferences and scientific conclusions.

This booklet is expected to serve as pedagogical innovation and suitable post-COVID-19 recovery strategies that teachers could also develop in their schools to enhance the teaching and learning of biology. Biology teachers could enhance places for learning to supplement PBL by starting projects such as small fish ponds and botanical gardens. Visits to communities living close to the school could also serve the purpose.

Welcome

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Station 1



Look Up! Why do some plants grow on others?



a) Observe the tree labelled Station 1 and record as many details as you can in the box below.

What I observed:

- i) Did you discover that this tree 'HAS' two different types of leaves?
- ii) Why do you think it has two different types of leaves?
- iii) Did you just say that there are two types of plants in one? That is quite true.

Now when you find one tree living on another how would you describe this type of biological relationship?

- i) How do the two plants benefit each other?
- ii) Observe other different plants around you. Do you see similar relationships?
- iii) Go to the internet and search for the word **mistletoe**... what do learn about it? Can you make a relationship with your observations in this activity?

Station 2



Who lives in this water pond?



- i) *What is the colour of the water in this pond?*
- ii) *How many types of living organisms can you observe in the pond?*
- iii) *Is that all?*
- iv) *Let us find out.*

Make a sketch of the organisms you observed in the pond

My sketches of what I saw

Who feeds on whom?

Use the organisms you have observed to make a food chain.

You realized that this pond has very few living organisms, how can we make it have many types of organisms?

Station 3



Why do we need trees?



- i) What is this place?
- ii) Where else do we find nurseries?
- iii) Why is it useful to have this place?
- iv) What type of reproduction is being applied in this place?
- v) What kind of questions would you have for the person who works here?

Station 4



From cradle to grave - What is life?

Choose a low hanging branch from this tree. Observe the leaves from the tip/bud to the base.

- i) Tip/bud of branch texture and appearance
- ii) Middle : texture and appearance
- iii) The base of the branch: texture and appearance
- iv) Observe the foot of the tree and document what happens to the fallen leaves

What happens to the heap of leaves when put in the Compost pit?



- i) Why is this life cycle of a leaf important in nature?
- ii) From what you have learned about the lifecycle of a leaf, what is your opinion about burning of litter and farm remains?

Station 5



What can we learn about this fig tree?



- a) *How old do you think this tree is?*
- b) *What has made this tree live for that long?*
- c) *What are the benefits of conserving such a tree?*
- d) *Why do you think there is no grass growing at the base of this tree?*
- e) *The small picture shows some grass growing at the base of the tree? What kind of grass do you think this?*

Visit the internet and read about carbon four (C4) plants



- i) *What are the relationship between the tree, the leaves the soil and the soil humus?*
- ii) *What do you think would happen if there was no decomposition?*
- iii) *Observe the soil at the bases of the two trees (INSETs). What do you notice? Why do you think this is so?*

Station 6



Which is the largest grass?



Let us now look at this interesting “Forest”.

- i) Pick a leaf from one of the branches, observe and describe its features.
- ii) Make a sketch to show the attachment of a bamboo leaf to its stalk.
- iii) Compare with other leaves on plants and grasses nearby what do you observe?
- iv) Why is Bamboo considered a giant monocotyledonous plant? did you know that bamboo is grass and NOT a tree?

Now let us study the stem of this plant. Observe at the nodes and the internodes of young and older stems? Comment about the differences?



- i) Ever wondered what is the fastest growing plant?
- ii) What are the uses of bamboo?

Station 7



How can we make waste water usable?



This water treatment system is used to collect water from the toilets which are treated and recycled back to toilets and to water the lawns. The system is made up of two sub-systems:

a) Biodigester: (Treatment plant system): This part is the one that receives the toilet water and it has several chambers. The first chamber contains Microorganisms that decompose the waste. They are anaerobic bacteria that feed on faecal material from the toilet and break them down. The sewage waste moves through other chambers up to the last chamber where it is seen as clear water. At the last chamber, the clear water is chlorinated. (water conservation -this water can be reused for purposes other than cooking and drinking) This water is pumped and recycled for use in various activities.

- i) *How does a water treatment system work?*
- ii) *Why is it important to have a water treatment system?*
- iii) *What is the biological process used in this treatment?*
- iv) *Why is the recycled water not used in any other area except in the toilets and lawns?*
- v) *The water treatment system does not receive water from laboratories, why?*

Station 8



Is my kitchen balanced?



- i) What types plants do you see in this garden?
- ii) Use the plants in the garden to prepare a menu of a balanced diet?
- iii) Present your menu in the most attractive way (drawing, picture, video)

Station 9



What can we learn from the Waste food Bin?



- i) What comes to your mind when you look at the picture?
- ii) Identify the food remains in this waste food bin?
- iii) Comment on the diet and possible lifestyle of the residents?
- iv) How can we avoid wasting food in our homes?
- v) What conclusions can you make?

Station 10



What can we do at the Lawns?



- i) *How is such an area called?*
- ii) *What are the uses of such an area?*
- iii) *How can the area be managed to serve the uses you listed above?*
- iv) *What are some of the negative effects of such a place?*

Conclusion

- What did you learn from the activities in each of the stations?
- Write down one new concept you have learnt/understood better interacting with the activities.
- Share with us any other ideas about this trial and experience.

**Can you do such activities
in your school?**

Goal _____

Key Action Step	Timeline	Resources	Expected Output	Responsible

Thank you and come again!