CUBE Kishore Bharati Assistantship Report November 2024 (First half)

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During the First half of November 2024, I was scheduled to attend ChatShaala but was unable to participate due to health issues. Although I had the opportunity to moderate discussions alongside Theertha M.D., Enas Shirin, and Kiran Yadav, I struggled to coordinate effectively with my fellow interns. This impacted my ability to fully engage in ChatShaala and support the team as intended. Despite these challenges, I still had some key highlights during my time there:

A) Developing Context to Curriculum by addressing Simple questions

1. Understanding Earthworm Breathing and Gas Exchange - The discussion began with an exploration of the respiratory system of earthworms. Earthworms do not possess lungs and instead rely on cutaneous respiration, where oxygen diffuses through their moist skin. This process is efficient due to the concentration gradient between the environment (higher oxygen concentration) and the earthworm's body (lower oxygen concentration). The discussion also compared earthworm respiration with human breathing, highlighting the use of alveoli for gas exchange in humans, and how diffusion is a universal mechanism in biological systems.

2. Understanding Capillary Structure and Its Role in Gas Exchange - Cubists discussed the role of capillaries in the circulatory system, emphasizing their thin walls and vast surface area, which allow for efficient gas exchange. This was seen as an essential feature for the transport of oxygen and nutrients across tissues. The conversation highlighted how this seemingly elementary concept is often underemphasized in educational curriculum, despite its critical importance in understanding physiological functions.

3. Understanding the Effects of Hypoxia in Chlorohydra and Moina - The conversation moved towards the effects of hypoxia (low oxygen conditions) on organisms like Hydra and Moina. Hydra, under low oxygen, can develop tumors, a phenomenon studied for its relevance to cancer research. On the other hand, Moina turns red when exposed to hypoxic conditions, which helps increase oxygen transport efficiency. The role of HIF (Hypoxia Inducible Factor) was also discussed, where this transcription factor regulates

the cell's response to hypoxia. The conversation explored how both organisms show different adaptive strategies in response to low oxygen levels.

4. Understanding Taxonomy and Systematics - A detailed discussion on taxonomy and systematics clarified the distinction between the two concepts. Taxonomy is focused on the classification and naming of organisms, whereas systematics studies the evolutionary relationships between organisms, tracing their common ancestry. This distinction is important for understanding the evolutionary patterns of species, and the conversation emphasized how systematics offers a broader perspective by including evolutionary and phylogenetic factors.

5. Understanding Fruit Fly Survival Strategies - In a practical experiment, fruit flies were observed to understand their survival mechanisms, particularly under starvation conditions. Flies were kept without food to see how long they could survive, with the results indicating that the flies could live for several days as long as they were kept moist. The discussion also highlighted how reducing egg-laying could extend their lifespan by conserving energy for self-maintenance, rather than reproduction.

B) Citizen Science Projects

1. Understanding Mosquito Identification - The discussion focused on understanding the identification of mosquitoes as a major citizen science project aimed at spreading awareness about Aedes and Non-Aedes mosquitoes.

2. Understanding Mango Flowering and Environmental Influences - A significant part of the discussion focused on the flowering of mango trees and the environmental factors that influence this process, such as temperature and day length. Observations were made on mango trees in Kozhikode and Mumbai, noting how mango trees flower based on seasonal changes and regional climatic conditions. The flowering patterns of mango trees were closely tied to temperature fluctuations, which regulate the development of flowers and fruit-bearing capacity.

C) Development through Discussion

1. To invite more Cubists in the ChatShaala whiteboard during the discussion along with a small summary was shared.

2. Screenshot of the whiteboard along with the summary and the leading question was shared alongside Theertha M. D; Enas Shirin to follow up the discussion.

3. Daily CUBE ChatShaala maps of participants were shared in all the CUBE groups, for acknowledging them.

D) Homelab updates

As of now I don't have any Model system in my Homelab, but I am planning to get some *Chlorohydra* and *Moina* from Sophia Resource Centre with the help of Sakshi, a collaborator from Bhandup, Mumbai.

Further plans - Culturing and Maintaining *Chlorohydra* and *Moina* in Homelab

E) Future Plans for Enhancing CUBE Program Operations

1. Resolving issues on Documentation of Context to Curriculum Chat on STEM Games.

2. Joining through the microphone mode - Participants find it difficult to join through microphone mode.

   Possible solution - We can have a screen recording of how to change the setting of the browsers so that Cubists find it easy to join through microphone mode.

3. Activation of CUBE groups - With the help of reliable Cubists, simple discussion can be carried out in small CUBE groups so that new Cubists find it easier to join the discussion.

4. Making celebration of Goof ups more streamline.