**EDF 4402 Biology Education**

**Assessment Task 1 Part A: Big Ideas in Biology**

**CoRe for VCE Biology Unit 2 Area of Study 2: Dynamic Ecosystems**

**Big idea:** Matter is cycled within an ecosystem

**What you intend the students to learn about this idea:**

* Matter is cycled within ecosystems because it is in limited supply; there is exchange between biotic (living) and abiotic (non-living) components of the ecosystem.
* Specific biogeochemical systems including those of water, carbon, oxygen and nitrogen.
* Bioaccumulation (biomagnification)

**Why it is important for students to know this:**

* Knowing how and why matter is exchanged between living and non-living components will deepen their understanding of the dynamic and complex nature of ecosystems. This is particularly important because we as humans rely on the cycling of matter for our survival.
* It is important for students to understand biogeochemical cycles before they study human impact on ecosystems and their sustainability (fossil fuels, deforestation, use of fertilisers, etc.)
* Bioaccumulation is a major issue, particularly within our aquatic ecosystems. It is a great example of the inter-related nature of ecosystems and that we as consumers must be aware of this issue.

**What else you know about this idea (that you do not intend students to know):**

It is not required that students know the specific chemical equations or reactions involved in the transfer of matter within the cycles (for example: how atmospheric nitrogen is converted to nitrate available to plants, or how carbon in plants forms coal. However, students need to know the general processes and theory behind the cycling of matter and understand that it is neither lost nor replaced.

**Difficulties/limitations connected with teaching this idea:**

The ‘big idea’ of biogeochemical cycles may be overwhelming if it is taught in specific detail straight away. Very important, therefore, is that the general idea of cycling of matter is understood first, which can then be scaffolded with detail in subsequent lessons.

Students may have difficulty visualising and/or comprehending the changes of state and form of the matter within the cycles, as it is not something you can actually see or easily replicate in the laboratory setting. The nitrogen cycle is particularly difficult as there are many stages and it is difficult to visualise.

**Knowledge about students’ thinking which influence your teaching of this idea:**

The level of interest may be low when students hear ‘biogeochemical cycle’ or ‘nitrogen cycle’, etc. Making the teaching of this topic interactive and relevant to their lives should be an aim.

**Other factors that influence your teaching of this idea:**

Students may actually have a vast amount of prior knowledge in relation to this topic. Teachers need to take a constructivist approach and students should be encouraged to contribute their ideas. For example, within the carbon cycle, students may have understanding of photosynthesis and respiration; within the water cycle, students may have understanding of evaporation, condensation and precipitation, just to name a few.

**Teaching procedures (and particular reasons for using these to engage with this idea):**

* In groups, get students to use flash cards and arrows to recreate the cycles. This is non-threatening, encourages discussion and allows the teacher to look for potential misconceptions or misunderstanding. It will appeal to the visual learners.
* Use story writing, poem or song to tell the travel story of a drop of water or atom of carbon through its cycle. This will appeal to the more creative students, and again will help identify misconceptions.
* Use discussion of current affairs to engage students and make it relevant to their lives. For example, “has anyone heard of the carbon tax?” or “what does the desalination plant do?”
* Virtual teaching aids such as interactive white-board programs or video clips of the various cycles help the students to visualise and conceptualise the cycling of matter within an ecosystem.

**Specific ways of ascertaining students’ understanding or confusion around this idea (include likely range of responses):**

* Students can use SLOWMATION to depict the water/carbon/nitrogen cycles. This will help identify any misconceptions or gaps in their knowledge.
* Students can demonstrate and verbally explain their understanding of the water/carbon/nitrogen cycles using flashcards and arrows.