Applying ESA’s 4DEE Framework to Guide the Development of Ecological Literacy for Non-majors

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4DEE Framework & Background

- In 2018 ESA endorsed a Four-dimensional Ecology Education (4DEE) curricular framework, recognizing that teaching ecological literacy requires the integration of:
  1. Teaching the hierarchy of core ecological concepts (CEC).
  2. Engaging in updated ecological field data collection and analysis, interpretation, communication practices (EP).
  3. Addressing the human environmental interactions (HEI).
  4. Connecting ecological concepts to cross-cutting biological themes - structure/function, scales, system change (CCT).

- Non-majors are an important audience who may benefit specifically from a method of teaching that connects ecology concepts and practices to society and important cross-cutting themes.

- Our goal is to build a more holistic ecological perspective and awareness along with skills for the large population of non-major students.

4DEE Rubric

- 4DEE learning can be designed using the following rubric as a checklist of the parts of each dimension as well as an explanation of the interactions:

- Application of 4DEE Rubric for Non-majors: A Lesson

  Carbon Cycling Exercise

  - In this activity, students work in groups of 3-4, using a given list or pre-made stack of index cards to connect pools & fluxes of carbon.
  - The provided pools of carbon contain the major sinks of carbon, but also some that should not be used, such as “Sun”.
  - Students must collaborate to model how carbon moves within the ecosystem and how humans are changing this.
  - Groups then split and rotate around the classroom to evaluate each others’ carbon cycle & the instructor points out common mistakes.

  - This exercise promotes 4 DEE learning by addressing the following dimensions & interactions:

- Application of 4DEE Rubric for Non-majors: A Project

  Species Conservation Project

  - In this project, students work in pairs to become an expert in their assigned IUCN Red List endangered species.

  - They are charged to create a well-researched, written conservation plan, as well as a short video to educate the general public.

  - They must include all ecologically-relevant information for their species (including drawing the socio-ecological system in which they reside), indicate current threats & propose a conservation plan.

  - Students are asked to recognize which communities of humans are impacted by the decline of this species and make a case for whether this species should be saved and how feasible it would be.

  - Students must then watch the videos of their peers and make a plan for how to integrate the information to save the most species or evaluate which are the priority species.

  - This project promotes 4DEE learning with the following dimensions & example interactions:

4DEE Recommendations for Teaching Non-majors

- Some likely key CEC for non-majors are: resources & regulators, species diversity, stability, energy flow, nutrient cycling, biome types & global climate change.

- Non-majors need to understand EP to de-mystify how ecological research is performed & evaluate it.

- An important point of interest for non-majors is HEI and therefore this needs to be central in teaching.

- Systems in CCT is an especially helpful emphasis for non-majors as it allows for different ways of thinking and understanding complex and indirect relationships.