An Across-The-Curriculum Approach to Quantitative Literacy in Environmental Studies

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Quantitative Reasoning and the Environment

Need for Quantitative Skills

- Understanding issues
- Careers
- Informed Citizenry
- Environmental Studies and Environmental Science

Across the curriculum Approach

- Encounter different skills and different applications throughout the curriculum
- Use skills in context
  - learning advantage
  - Habit of mind
  - But hard to ensure students get all skills
  - Harder to assess

Skills

- Basic arithmetic
  - proportion; percent
  - Unit conversions
  - Rate of change
- Data presentation and analysis
  - error
  - graphing
  - Descriptive statistics

Skills (cont.)

- Algebra; Modeling
  - Manipulating equations
  - Linear and non-linear functions
  - Modeling
- Geometry; Trigonometry
  - Circles
  - Squares, rectangles, Triangles
  - Trigonometric functions
  - Spheres
  - Cubes and other solid figures

Curriculum Grid Env. Science

Aquatic

- Basic arithmetic
- Data presentation and analysis
- Algebra
- Modeling
Examples: BIO 107 Ecology
- Data collection and presentation
- Preference of Fall Web Worms for maple versus cherry leaves
- Spreadsheets, means, standard errors, graphs

Examples: ENV 201 Water Resources
- Quantifying Stream Discharge
  - Area calculations
  - Unit conversions
  - Data management
  - Spreadsheet skills
  - Graphing

Examples BIO 318 Terrestrial Ecology
- Matrix model using survival and reproduction in several age classes.
- Stable population and age classes
- Effect of survival at different ages

Does it work: Evaluation
- Overall: Basic Q skills and QL skills tests

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**Curriculum Grid Env. Science Terrestrial**

- Basic arithmetic
- Data presentation
- Algebra
- Number sense and analysis
- Modeling

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**Curriculum Grid Env. Studies**

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Does it work: Evaluation

- Pre/post test on module

Challenges

- Only one example of a skill: low retention
- Hindered by basic skills

Task 1. If the island is 267 ha and each bird needs 0.1 ha, what is the maximum population? (A hectare is 100m by 100m)

Challenges: basic skills (cont.)

- Now design an experiment to answer the question:
  - Is it better for a one year old to produce more young or to put their energy into survival? Start by reducing the survival of one year olds by 10% and see what % change in fecundity is required to recreate a stable population.

Extra credit:
- What is 10% less than 0.7?
- What is 20% less than 200
- What is 5% more than .01

- Average = 1.7, Range 0-3
- Lack of practice?

Conclusions

- Quantitative Literacy skills are weak
- Across the curriculum makes sense
  - But does it work?

- Projection
  - Students need to encounter quantitative issues more often.

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