



Quantitative Skills in Science:

Curriculum models for the future

Australian Learning and Teaching Council (ALTC) Priority Project - Curriculum Renewal - 2010



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QS in Science



Quantitative Skills (QS): the ability to apply mathematical and statistical thinking and reasoning within a given external context.

20th century

Quantitative experimental procedures:
measurements, calculations,
statistical analysis

Technological advancements:
map human genome, mathematical
modelling to understand complex
systems

21st century

Application of science to solve
global issues:
Climate change, epidemics
(obesity, infectious
diseases), sustainability,
resource management

QS in Science



Harnessing QS to fight cancer: the power of mathematical modelling in the biosciences

Individual Mutations Are Very Slow to Promote Tumor Growth

September 28, 2010



Individual cancer-causing mutations have a minute effect on tumor growth, increasing the rate of cell division by just 0.4 percent on average, according to new mathematical modeling by scientists at Harvard University, Johns Hopkins University and other institutions. Their research reinforces that cancer is the culmination of many accumulated mutations, and highlights the fundamental heterogeneity and randomness of many cancers. [Full Story](#)

Source

Harvard University

QS in Science – currently



- Widespread agreement of need for QS in science graduates
- Preparation of scientists, doctors, etc
- Negative views towards quantitative subjects amongst secondary & tertiary students

QS in Science – currently



- Universities face decline in science enrolments
- Pressure to retain students while delivering QS
- Need for a strong interdisciplinary approach to effectively deliver QS

How does this project fit?



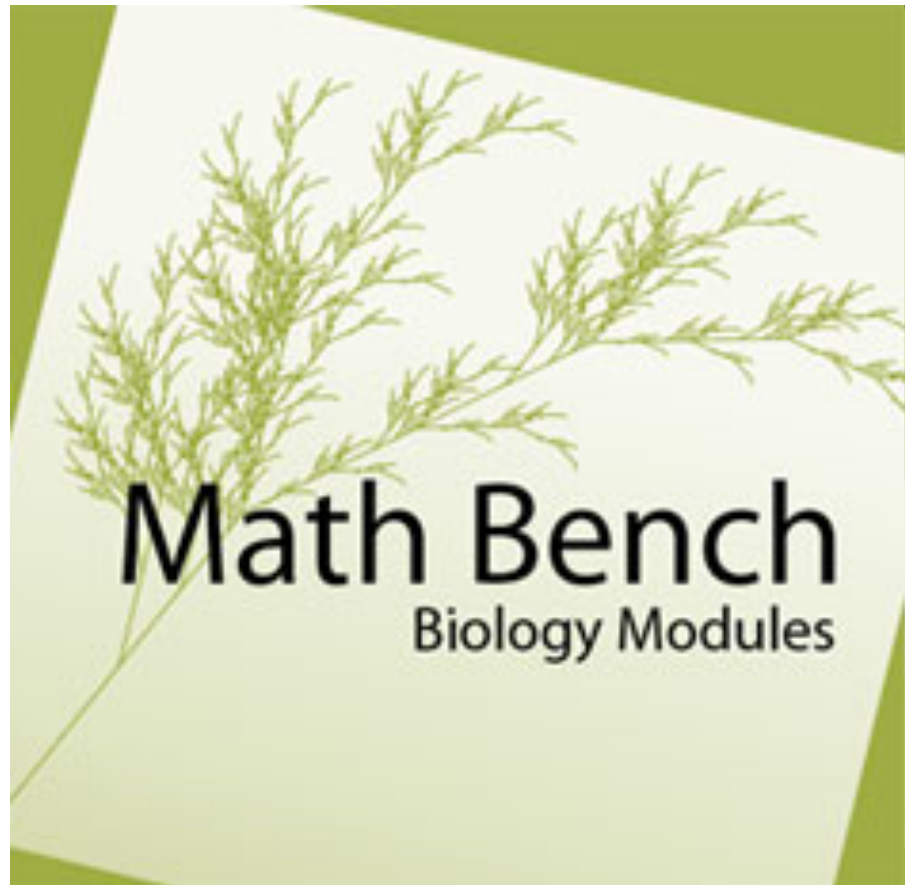
- Project team members bring local and international perspectives to this global issue
- Look for big picture solution
 - Program level: how to conduct curriculum reform
 - People level: how to get science and maths academics to work together in T&L
- Cross-disciplinary approach to cross-disciplinary problem

Outcomes



1. Curricula structures – benchmarking
2. Models for curricula change in science higher education degree programs
3. Framework for academic change (cross-disciplinary collaboration)
4. Dissemination activities

Example – MathBench, UMD



Main goal of MathBench is to **integrate quantitative approaches** and embed mathematics more **deeply into the undergraduate curriculum**

Example – UBC Integrated Science



Integrated Sciences
Making Connections in Science



Students in Integrated Sciences design their own upper-division curriculum, which must bridge at least two disciplines within science or beyond. **These custom curricula must include Integrated Sciences "core" courses (ISCI courses) that are explicitly interdisciplinary.**

Activities (curriculum structure)



1. Undertake site visits

March – May 2011

2. Evaluate QS in Science curricular structures

June – July 2011

3. Analyse factors impacting/inhibiting curricula change

July – August 2011

4. Develop models/recommendations for curricula change

September 2011

Activities (academic change)



1. QS resource inventory

June 2011

2. Document resource implementation at partner institutions

September 2011 – June 2012

3. Analyse data and develop framework for resource adaptation, and interdisciplinary partnerships

July 2012

How can you help?



1. Acknowledge the issue and that a collaborative approach to its solution is essential
2. Direct us to key people when we contact you!
3. Offer your science degree a for case-study and facilitate site visits
4. Keep us with this project (invite us back next year)
5. What are the QS skills of your science students?