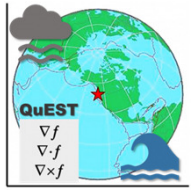
QuEST: Quantitative Earth Sciences Transformation

https://blogs.ubc.ca/eoasquest/



QuEST project planned deliverables

1) **Recommend** practical approaches for re-imagining interdisciplinary education.
2) **Align** courses & curriculum with existing and emerging employment markets and research priorities.
3) **Suggest** ways to enhance academic, social and professional experiences of QES students.
4) **Initiate actions** to attract, recruit and retain students with quantitative capabilities and interests, e.g., showcase rewarding & meaningful opportunities available to QES students upon graduation.

Context for initiating QuEST

Drivers for EOAS disciplines

- Global growing demand for geoscience expertise;
- Declining enrollments of geoscience students everywhere;
- Increasingly quantitative and data-centric disciplines;
- Changing disciplines & career opportunities in geoscience;
- Evolving expertise & research priorities in EOAS.
- UBC's strategic plan - strategy #11 …

"Strategy 11: Education Renewal seeks to facilitate sustained program renewal and improvements in teaching effectiveness …"
(Source Advancing Education Renewal.)

Decision making requires *Curriculum Review*

What is curriculum review? A framework for …

- Re-imagining the academic direction of the program;
- Improving student learning experiences;
- Preparing graduates for the next stage of their life;
- Increasing transparency for instructors, students, the institution & employers;
- Managing program growth (or decline);
- Ensuring a program meets required standards.

CTLT: "What is program renewal?"

Methods

Curriculum review is *complex* because it involves

- many courses;
- multiple stakeholders;
- institutional politics;
- cultural, educational, & scientific values;
- rapidly evolving – and multidisciplinary – subject contexts.

Components of curriculum review:

- **The field or discipline**: Approaches / tools
  - View priorities/trends across sectors & peer institutions
  - Comparator analysis
  - Analysis of need, demand, and career pathways
- **The discipline at UBC**: Approaches / tools
  - Program vision or identity statement
  - Program outcomes
  - Signature pedagogies
  - Students' experiences
- **Courses and program structure**: Approaches / tools
  - Curriculum mapping
  - Core requirements & capabilities
  - Elective structure and options
  - Development of courses & learning experiences

Methods, cont'd

Seven aspects to curriculum review – which will inform recommendations.

a) Program characterizing and envisioning;
b) Individual and collective perceptions & priorities using interviews & discussions;
c) Curriculum mapping (mainly quantitative courses);
d) Characterize courses, content and learning activities across QES courses;
e) Feedback about students' learning, experiences and priorities;
f) Discipline-specific career options and prospects, including evolving nature of discipline(s), from industry, academic and, professional sources;
g) Curriculum and course improvement methods: tactics, best practices and precedent.

QuEST project addresses all these.

QuEST data sets target these tasks, informing recommendations in our final report.

Methods e.g. 1:
Review existing curriculum

Interactive course dependencies tool: https://www.eoas.ubc.ca/~quest/

Example observations . . . just observations.

- Two ATSC & two GEOPH 4xx courses have no EOAS prerequisites.
- Computing expectations are not always explicit.
- Math requirements could do with more detailed alignment between learning goals of courses and needs in EOAS.
- Others …

Methods e.g. 2:
Determine individual & collective perspectives

Interviews and conversations with faculty, students, professionals

- Interviews about career preparation
- Interviews about identify, responsibilities, & improving quantitative learning
- conversations & open-ended survey comments from students
- Connect with colleagues at peer institutions
- And others.

E.g., paired interviews summary at https://blogs.ubc.ca/eoasquest/files/2023/04/interviews-summary-230411.pdf

Some ideas targeting courses

- More explicit attention to application-oriented teaching.
- Consistent, effective syllabi for every course (a UBC expectation).
- Career preparation in courses:
  - Eg, partner with UBC career services for implementation support.
  - Bring in professional visitors or alumni.
- First year course content that is more representative of the quantitative nature of Earth sciences (appropriate to 1st yr).
- Specific courses for grad/ugrad audiences:
  - *Many suggestions, but "zero sum" is always a challenge.*

Preliminary ideas only

Ideas targeting degree specializations ("programs")

- Program learning outcomes (PLOs) – standard, practice.
  - *"What student should be able to demonstrate upon graduation."*

PLOs at CTLT

- Capstone experiences for all.

Capstone experiences

- Align – and showcase – professional requirements.
  - *Currently under way.*
- Restructuring degrees or credentials.
  - *Many options & ideas, but not trivial.*

Preliminary ideas only

Ideas targeting department-level initiatives

- Active support for student social and professional networking.
- Enhanced faculty communications:
  - *Awareness about degree pathways.*
  - *Knowledge of courses and their content.*
  - *Share pedagogic successes, etc …*
- Marketing – next slide
- Wholesale overturning of current degrees seems inadvisable at this time.

Preliminary ideas only

Marketing; increasing visibility

This list is long – here are just a few …

- Partnering across campus (e.g. the "climate math" project).
- A staff or faculty service role that is "marketing" (not PIRC) to seek out and coordinate activities. Many ideas and opportunities. Examples of ideas …
  - More active engagement with campus opportunities:
    - 1st year science, career days, EGBC liaison, etc.
  - Seek opportunities for community engagement.
    - UBC geering up; MineralsEd; schools (via PME?); etc.
- New first year course for "keen" science students.
- "Advertising" – Dep't flyer, increased visibility in UBC school marketing, etc.
- Enhance QES research groups interaction with ugrads.

Conclusions

Data gathering essentially done; synthesis & recommendations under way.

QuEST work remaining

- Contribute to & learn from, geoscience educator's workshop, July;
  - Preparing Students for Careers, Licensure, & Industry
  - An Online Learning Environment about Geoscience Careers and Licensure
- Finish synthesizing data.
- Generate final report and package for convenient consumption.
- Articulate needs for new & ongoing activities.

Questions? Suggestions? Critique?

Write below, or email fjones@eoas.ubc.ca