UBC and CU Science Education Initiatives
models for achieving sustainable change in university science education
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The UBC and CU Science Education Initiatives (SEI) at University of British Columbia and the sister SEI program at University of Colorado have as their goal the achievement of sustainable institutional change towards evidence-based science education. These programs fund departments to take a four-step, scientific approach to undergraduate education:

1. Establish what students should learn;
2. Scientifically measure what students are actually learning;
3. Use instructional approaches guided by research on learning and measures of student learning;
4. Disseminate and adopt what works.

In this poster, we discuss the design of the SEI change model.

Underlying Reasoning
Logical unit of change is the Department
Department = the essential unit. Small scale changes (one or a few courses involving a few faculty) is an important research step, but does not result in widespread changes in instructional practices. Need change to involve majority of faculty in department.

Change must be driven by department — Faculty are experts in their science fields. The faculty and department as a whole need to decide what students should learn, adopt or develop good measures of relevant learning, and change instructional approaches.

Evidence is key — Most faculty will feel that change is necessary if there is good data showing students aren’t getting important ideas/concepts, or evidence of students seeing subject as less interesting and/or useful after taking course.

Additional resources are needed to support the process of change — These changes take faculty time

Effective teaching can be more efficient than current practices (and more fun!)
Use of good materials, less repetition/overlap of material, team teaching large courses, effective use of technology, etc. can result in lower resource requirements in long-term.

Approach

Significant 1-time investment of resources at CU and UBC
Concentrated (~1-2 M/dep. over 5 years) to fund change activities; maintenance of change should not require extra resources.

Departments compete for funding — Criteria: commitment and readiness to undertake widespread sustained effort to improve undergraduate education

Faculty/Department Interactions
- Regular meetings with departmental liaisons, department Heads/Chair, etc., some meetings with individual faculty & whole dept.
- Lecture series, workshops (learning goals...), yearly event - SEI activities

Materials Archive System
- Developing online course materials archive system:
  - Course materials (e.g. lecture notes, clicker questions, assignments, ...)
  - Instructor comments on use of materials and reflections on course
  - Common student difficulties & how to address them

Results so far
LOTS happening (see lists under depts. on left & right)
rapidly growing # faculty involved, many courses being improved, new data from multiple disciplines on what is working and not.

SEIS Model works well in many circumstances
Pool of excellent SES candidates out there

What should students learn?

SEIS Development
Frequent meetings with considerable effort and emphasis on:
- Development of SEIS's understanding of how people learn, effective pedagogy, evidence supporting educational approaches
- Science education research base & how to do research
- Effective ways to work with faculty & communication of good practices

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SEIS Approach involves all 4 Basic Change Models
Emergent Final Condition

Gooed:
Change is hard! Ok, we know that, but it's harder than we thought; can be frustrating and discouraging SES

Significant minority of faculty resisting (expected)
Particularly difficult when:
- Many faculty teach different sections of same course without coordination (hard to reach consensus)
- Don't have a critical mass of faculty who are open minded about change
- Strong sense of personal "ownership" of course (other than dept. ownership) & misconception of what "academic freedom" means.
- Low opinion of students by some faculty -- how to overcome?