Campus-Wide Computation Initiative: A New Model for Computing Education

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A word on our schools....

• size and type

• programs

• our goals before CPATH came along
Our focus, and the challenges

Build computational skills in non-CS disciplines:

• students
  – both: convince non-CS students to study computation
  – Union: provide alternate pathways to major/minor

• faculty and departments – convince them to devote resources, advising, and space in their curricula to incorporate computation

• administrators – convince them they should promote computation
Factors affecting.....

Students:

• negative impression of computing (the field and the practitioners)
• lack of self-confidence
• need to be aware of relevance of computation to their field

Faculty:

• startup/learning costs
• some not using computation in their field (teaching or research)
• time/resources needed to develop or modify courses
Curriculum Changes

• Intro to computational science course
• Intermediate courses (in CS, in other fields)
• Course modules (in non-CS fields)
• computational methods minor, track, or certificate

Key features:
• courses that are relevant to other fields
• courses that do not have many prerequisites
Intro to Computational Science

• goal – students learn to think computationally, write short programs (2-3 pages)
• use a scripting language (Python)
• take more time for basic concepts (functions, control structures, sequences)
• cover regular expressions (to process data)
• cover control of external programs through generation and execution of command scripts
• use datasets and applications from multiple disciplines
• application oriented projects - e.g., analysis of large economic data sets using R (statistical package)
Intro, cont.

- No object oriented design/programming
- Algorithm analysis
  - Lafayette – none
  - Union – minimal introduction
- CS & ECE majors
  - Lafayette – these students will not receive credit for this course.
  - Union -- is one of 5 intro courses. Open to entire campus, including CS and ECE.
After the intro…..

• Faculty develop modules and courses in own discipline (grant support)

• CS develops intermediate application oriented courses

• Non-CS faculty and students pursue computational projects (grant support)

• Push for computational prerequisites or requirements in other departments.
Building interest in computation

- Faculty are key, students will follow
  - consultation on curriculum
  - joint development of track/minor/certificate program
  - support for change in other depts. (modules, courses, tracks)
Faculty Interest....

Some things don't work!
  – email to entire faculty

Some things do work
  – one on one conversations; reminders before advising
  – money, ongoing contact, more conversations
  – administrators who are interested and will help push
Building student interest

- Publicity: advantages of having computational skills (Career Center)
- Publicity: information about courses, minor, tracks
- Advising: faculty from other depts. (faculty are key!)
Where are we now? (Lafayette)

- computational methods minor
- computational neuroscience track
- quantitative economics track
- computational methods for engineering (track under development)
- introduction to neuroscience (computation module)
- intermediate art (computation module)
- agent based modeling (research)
Where are we now? (Union)

- computational methods minor, under development
- computational neuroscience track
- digital art program (joint between CS and Visual Arts)
- Bio & CS – Intro to Bioinformatics course
- Economics – computation integrated into “Contemporary Problems in macroeconomics”
- ECE – modules for “Acoustics of Speech Production” and non-majors course
- Physics – module on Monte Carlo Methods in statistical mechanics
- Chemistry module for intro computational methods course
Questions?