

Addressing enrollment declines & increasing participation

Broadening CS at the Entry Level Interdisciplinary Science & CS

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www.evergreen.edu/cise NSF CNS-0608701

www.evergreen.edu/bdei NSF EIA-0310659, IIS-0505790

<http://canopy.evergreen.edu/canopydb> NSF DBI-0417311, DBI-0319309, ...

<http://www2.evergreen.edu/quantecology>

Paper (with Richard Weiss), CCSC-NW October 2007

NSF'S ICER (CPATH) INITIATIVE

NSF asked: Why is CS in crisis? What can be done?

Northwest Region: <http://www.evergreen.edu/icer>

Improve the quality of computing education

Attract more people

Improve retention....

Strengthen interdisciplinary connections....

Improve CS educational research

Northeast: http://www-net.cs.umass.edu/nsf_icer_ne/

Midwest: <http://www.cse.ohio-state.edu/~lee/NSF/home.htm>

Southeast: <http://www.eng.unt.edu/ICERWorkshop/reports.html>

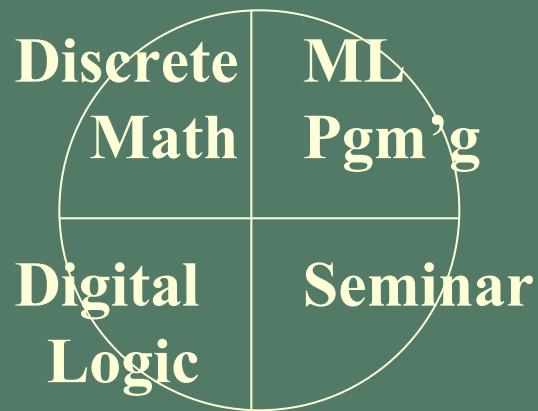
An new Entry Level Program (CS1)

Data & Information: Quantitative Ecology

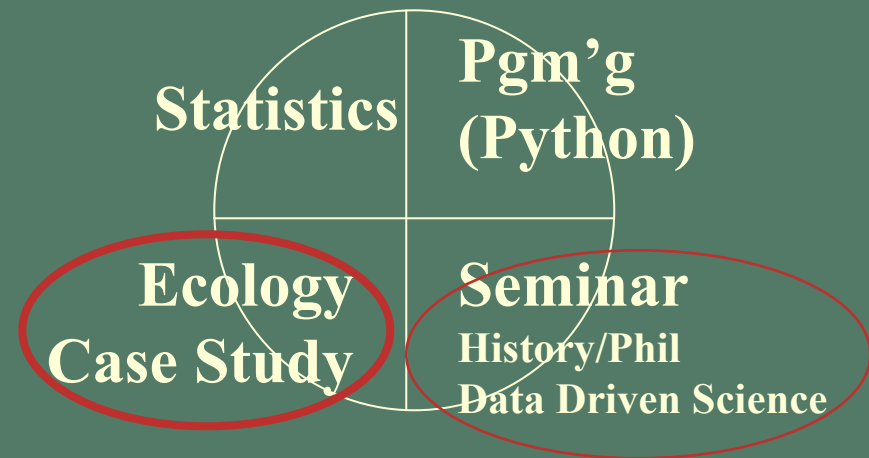
Where is student interest? ...Ecology, Multi-Media, Biology....

Strategy: broaden CS1 to address one of these....

Data & Information
Prior Years



Data & Information:
Quantitative Ecology
Fall 2006-7



Will all future IT workers be CS majors?

The Ecology Case Study

8 PNW forested sites (1kcs) from 50 to 950 yrs old

Ecologists: Nadkarni, vanPelt, McIntosh, et al

- Statistical analysis (in R)
- Programming Graphics (in Python)
- Human Factors of Data Presentation
- Weekly Labs - in pairs, not in CS Lab
- Field Trip to Forest Site, resampled
- Guest Lectures
- Team Project (2 weeks, full time, many extended a lab....)



Seminar

Philosophy/History of Data-Driven Science

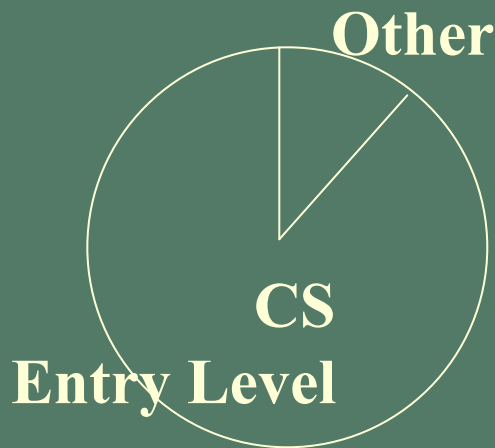
- Weekly Assigned Reading:
 - Aristotle's *Physics* (selected readings)
 - Headrick's, *Knowledge in the Age of Reason and Revolution*,
 - Kuhn's *The Structure of Scientific Revolutions*,
 - Fleck's *Genesis and Development of a Scientific Fact*,
 - Fortun & Bernstein's *Muddling Through*,
 - Suzuki et al. *Tree: A Life Story*.
- Weekly (written) Study Questions
- Weekly Seminar Discussions
- Three Assigned Papers (every 3rd week)

Data & Information: Quantitative Ecology

Student Constituency

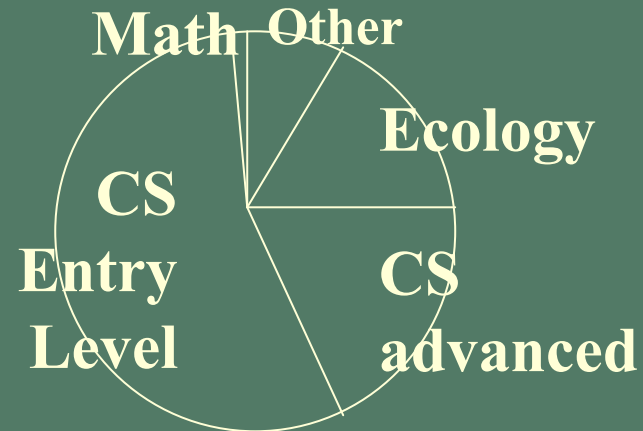
Diversity wrt Discipline

Data & Information
Prior Years



(Estimated)

Data & Information:
Quantitative Ecology
Fall 2006-7



wrt Race-Ethnicity-Gender : better....

Data & Information: Quantitative Ecology

Some Improved Retention

<u>Entry Level CS</u>	<u>Fall</u>	<u>Winter</u>	<u>Spring</u>
D2I to CSF 2006-7	24 intro CS 7 adv CSF 5 adv Non-CS (36 total)	23 96%	18 75% 79% from Fall
“other” to CSF 2006-7	--	23	12 52%
Total Retention	24	46	40 87% from Winter
Prior Year	27	21 78%	16 76% 59% from Fall

Interdisciplinary Science and CS

Does interdisciplinary CS help ?

Preliminary results as per ICER NW recommendations

Improve the quality of computing education?

Student engagement ↑; ~ = content **

Attract more people ?

Yes, some ecology students added CS minor

Improve retention ?

Apparently...but 'n' is small **

Strengthen interdisciplinary connections ?

Yes!

Improve CS educational research ?

Raised faculty awareness and started efforts **

** how about small colleges' collaboration to
Coordinate assessment, pool 'n'

Strategies for Interdisciplinary CS

1. Take a broader view of CS (why?)
 - better CS1
 - Deepen the capstone
 - Real-world examples for CS 'big ideas'
 - ...
2. Capitalize on research collaborations
3. Publish exemplars / offer workshops
(team-teaching, group work, projects, labs)
4. Alleviate institutional barriers
5. Encourage visitors: industry, labs, etc.
6. Teach accessible, but powerful, 1st languages
7. Encourage experimentation!
 - *Animated Forest*
 - Computational Linguistics, Ontologies, Semantic Web, Search

Broadening CS at the Entry Level Interdisciplinary Science & CS

Questions?

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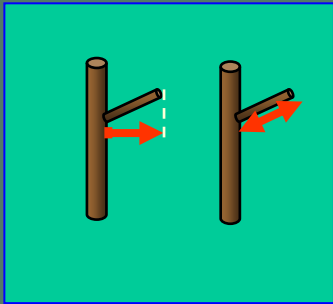
www2.evergreen.edu/quantecology

Canopy Data Base Project

CanopyView

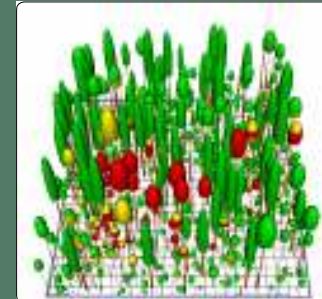
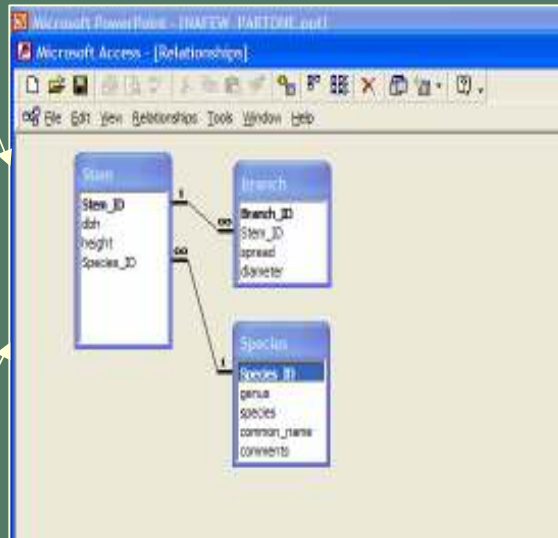


Entities

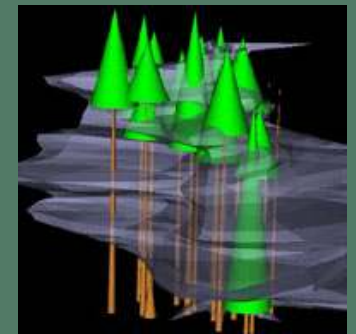


Observations

DataBank



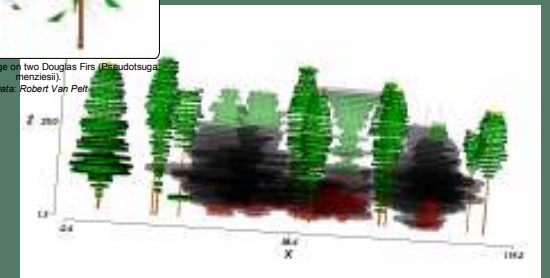
Dwarf Mistletoe (Arceuthobium) infection in a Pacific Northwest forest
Data: David Shaw



Foliage coverage of two Douglas Firs (Pseudotsuga menziesii)
Data: Robert Van Pelt



*CanopyStats
coming....*



NSF'S ICER (CPATH) INITIATIVE

INTEGRATIVE COMPUTING EDUCATION & RESEARCH NSF

1. CS content changed (changing!) radically....
2. No uniform agreement on the core...
3. Graduates lack a systems approach....
4. Dwindling pipeline....
5. US industry competitiveness threatened....