Department of Chemistry
CWSEI Progress & Plans

April 28th, 2008
Jackie Stewart, Skylight Research Associate

Current CWSEI Projects

- First Year Laboratories
  - Committee struck in January of 2007
    - To discuss labs at all levels of the curriculum
- CHEM 233 – Organic Chemistry for the Biological Sciences
  - Several iterations of redesign (Skylight)
    - In-class guided inquiry activities
    - Formative assessment (online homework, problem sets, clickers)
  - C-LASS survey (learning attitudes)
    - Validation interviews with organic chemistry students

First Year Courses

- CHEM 111/113
  - Students without grade 12
  - 4 hours of lecture & 3 hours of lab per week
  - Enrollment of ~220/150
- CHEM 121/123
  - 3 hours of lecture per week
  - Alternate weekly 3 hours "wet" lab and 3 hours of "dry" lab
    - Carefully developed guided-inquiry labs
  - Enrollment of ~1700/1400
- CHEM 154
  - Engineering students
  - 3 hours lecture per week & 3 labs per term

Committee Members

Lab Committee
Michael Blades
Guillaume Bussiere
Ed Grant
GrenPatey
Subramanian Iyer
Mark Thachuk
Dana Zendrowski

Evaluation Sub-Committee
Brian Cliff
Greg Dake
Neil Dryden
Derek Gates
AnkaLekhi
Sophia Nussbaum
Laurel Schafer (chair)
John Sherman
Jackie Stewart
Peter Wassell

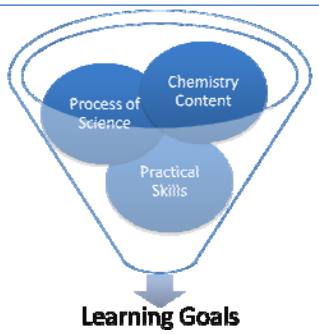
Issues

- Perception that students are not retaining lab skills from first year
  - UBC among the lowest in wet-lab hours of Canadian universities (chemistry)
- Guided inquiry vs. traditional
- Extent of practical skill development
  - Most students will not major in chemistry
- Extent to which labs reinforce lecture concepts

CWSEI Opportunity

- Focus on CHEM 123
  - Evaluation of guided-inquiry labs
  - Optimize wet vs. dry lab learning experiences
    - Potentially increase wet/dry lab hour ratio
- Add to the scant literature on labs
  - Lack of assessment tools
  - Lack of evidence that a lab experience enhances learning of concepts
  - Flawed design of many studies

Purpose of Labs



Challenges

- Defining learning outcomes
  - Broad range of students
  - Not logistically possible to sync up lab to lecture
  - Practical skills/chemistry content/scientific thinking
    - Cognitive/psychomotor/affective
- Deciding on a pedagogical approach
- TA inconsistencies

Priority Learning Outcomes

- Perform common laboratory procedures correctly
- Think critically
  - Recognize whether results and conclusions "make sense"
- Interpret data and report data effectively
- Present results in a clear and concise manner
- Prepare in advance for laboratory work

Evaluation Components

- Process
  - Is the lab course functioning as intended?
- Outcomes
  - Are the desired outcomes being met?
- Interactions between process and outcomes
  - What aspects of the course are responsible for the various outcomes?

Preliminary Data

- Committee members visited labs and informally interviewed students
- Pre/post course surveys
- Post-dry lab/pre-wet lab surveys for several experiments
- Student interviews
  - Perceptions of what the lab was about, what they think they were supposed to learn, reflection of wet lab experience

Goals & Timeline

2007/2008	Define learning goals for first year labs Conduct preliminary studies (surveys and interviews)
2008/2009	Plan evaluation strategy Establish baseline Refine labs/design new labs
2009/2010	Implement changes to labs Collect data Refine labs
2010/2011	Implement refined labs Collect data

Looking Ahead

- STLF starting in August
  - Jennifer Duis, PhD in Chemical Education
    University of Northern Colorado
- TA training grant (VP Academic)

Computer Science: Learning Goals

Beth Simon

Donald Acton, Patrice Belleville, Paul Carter, Kurt Eiselt, Mike Feeley, Ed Knorr, David Lowe, George Tsiknis, Kim Voll, Steve Wolfman

Jared Taylor, Life Sciences

Learning Goals:
A Tale of Two Efforts

- Course and Topic Level Goals
  - All 5 1st and 2nd year core courses
  - Process, Results, Reflection
- Study of Learning Goals in the Classroom
  - Case Study in a non-majors course
  - What value do students see?
  - How does it change the course?

Goals

- Describe, in detail,
  - What students can do
  - When
  - How assessed
- Look for (eventually)
  - Duplication
  - Missed dependencies
  - More consistency across sections/instances

Process

- Topic Goals
  - By the end of the course students can…
  - First Cut: Exam analysis
  - Lecture materials
    - ID topic areas
    - Make sentences that complete
    - By the end of the course students can…
- Course Level Goals
  - Discussion
  - Grid-based placement of Topics under Course
  - Fix, re-do update

What did we get out of this?

- Exam design is MUCH easier
- There are important learning goals we are not assessing
  - Some course goals are not supported by topic goals
- Supported a coherent “story” for a class
  - And identified beyond anecdote where there are issues
- Enables iterative refining of course materials
- Incredibly valuable to discuss, debate

Tale 2:
Study of Learning Goals in the Classroom

- CPSC 101: Connecting with Computer Science
  - Non majors, varied purposes
- Instructors previously involved interested in developing LGs
  - Help make clear what we really want students to know
    - Not just programming ☺

Learning Goals Creation Process

- Discussion directed by topic areas (lectures)
- Instructor in Spring 07 made LG as developed and re-developed lectures.
  - Re-worked them in Fall 07 and…

How LGs were used (effectively)

- Featured LGs prominently at the beginning of each class.
- Started the term with a LG of learning how to use LGs to know what to learn in the class.
- Made (and kept) an explicit promise that all exam questions would be based on LGs

Impact on Students

- Interviews
  - 11 students just after first midterm
- Surveys:
  - Please complete the following sentence five times:
  - For me, in the class, the use of learning goals was _____

What do students say?

N=239	Study	Exams	Lecture/ course	Focus	Understanding	Learning
Study	50					
Exams	13	25				
Lecture/ course	2		39			
Focus	21	14	33	102		
Understanding			5	3	11	
Learning			1	5	1	12

Focus

- Focus
- On track
- Summarize
- Outline
- Expectations
- Organize
- Guide

What do instructors say?

- We have a contract with students
  - We and they are clear on their responsibilities
    - Separates key material from interesting discussion
    - Keeps any one topic from accidentally dominating course
- Exams are very simple to write
  - You've already done the work
  - Though it does take time and refinement to write good, examinable topic goals
- Makes it much easier for frequently revised courses

Look for a full report by end of summer 2008.

Questions/Comments

Helping Students Know and Practice What They Need To Know

- Collaborative Web Site supporting creation and review of multiple choice questions
- Students create questions, distracters, and explanations of correct answers
- Other students can “practice” questions and comment on results
- Students reflect, develop meta-cognitive skills, explain

Interested for 2008-2009? Email: esimon@cs.ubc.ca

	Study	Exams	Lecture / course	General Focus	Focus	Track	Summary	Guide	Organ-ize	Outline	Understanding	Learning
Study	50											
Exams	13	25										
Lecture/ course	2		39									
General Focus	10	10	11	38								
Focus	2	2	6	1	14							
Track	1		6			12						
Summary			3	1			6					
Guide	7		2	1		1		10				
Organize	1		4	1					8			
Outline		2	1						1	7		
Understand-ing			5	1			1		1		11	
Learning			1	3			1		1		1	12

EOS-SEI Year 1 Progress

Earth and Ocean Sciences – Science Education Initiative.

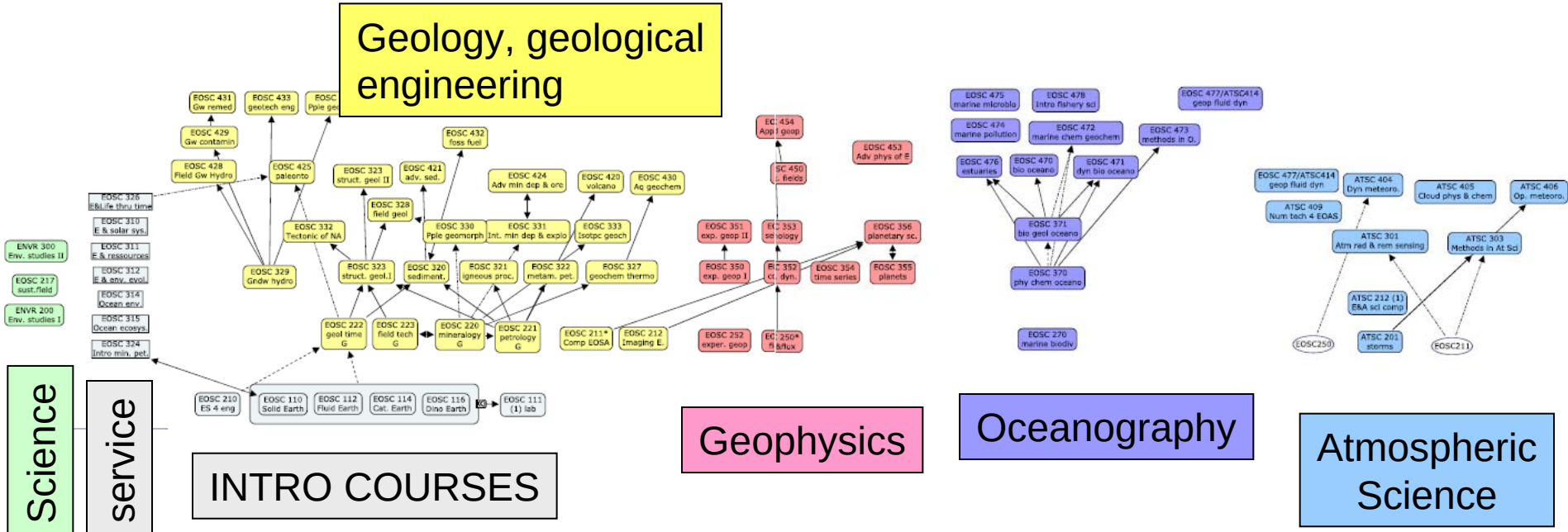
April 28, 2008

EOS Teaching Initiatives Committee – Sara Harris (Chair & Liaison), Mary Lou Bevier, Jim Mortensen, Douw Steyn, Francis Jones (STLF), Brett Gilley (STLF), Ben Kennedy (STLF), Tom-Pierre Frappe, Peter Lelievre, Melissa Grey, Jamil Rhajiak (Phil Hammer, Greg Dipple, Stuart Sutherland)
EOS faculty perspective – Roland Stull
Many others involved, including graduate and undergraduate students

Overview

- The EOS department
- EOS' approach to the CWSEI project
  - Mostly course-based, with…
  - Curriculum considerations and…
  - Overarching components
- Two examples
  - Student Attitudes about Earth Sciences Survey (Ben Kennedy)
  - Perspectives on EOSC 114 Course Transformation (Roland Stull & Francis Jones)

The EOS department – many “streams”



EOS-SEI

Our approach: Course Transformations

- Course working groups
  - Primary instructors & STLF
  - Faculty members who teach “related” courses (pre-, post-, co-requisites)
  - Graduate and undergraduate students
- Faculty buyouts (for primary instructor)
  - For 3 terms, choice of:
    - ~0.5 course release (NOT the targeted course)
    - 6-hr TA or undergraduate help
- Aiming for high faculty involvement – important for sustainability

EOS-SEI

EOS-SEI LONG-TERM PLAN

UPDATED DRAFT, STILL FLEXIBLE

P1 = first planning term; P2 = second planning term; T1= first teaching term, etc.

	TARGETED COURSES	2007 Fall07	2008 Spr08	2008 Sum08	2008 Fall08	2009 Spr09	2009 Sum09	2009 Fall09	2010 Spr10	2010 Sum10	2010 Fall10	2011 Spr11	2011 Sum11	2011 Fall11
STARTED	EOSC 114	P2&T1	P3&T2	P3	T3	T4								
	EOSC 111	P2&T1	P3&T2	P3	T3	T								
	EOSC 221	P1	T1	P2	P2	T								
	EOSC 324	*MLB*												
	ENVR 200	*DS&SH*												
	EOSC 112		P1	P1	P2&T1	P								
	EOSC 220		P1	P1	T1	P								
	EOSC 212		P1	P1	T1	P								
	EOSC 210		P1	P1	T1	P2	P2	T2	P3	P3	T3			
	EOSC 116		*SS*											
	ENVR 300		*DS&KC*											
Below this line, course sequence is under discussion. Are you involved in the courses on this list?														
	332 (JM)				P1	T1	P2	P2	T2	P3	P3	T3		
	322 (GD)				P1	T1	P2	P2	T2	P3	T3			
	EOSC 449				*MLB*									
	ENVR 449				*KO*									
	EOSC 211 (RP)					P1	P1	T1	P2	P2	T2	P3	P3	T3
	ATSC 201?					P1	P1	T1	P2	P2	T2	P3	P3	T3
	EOSC 370 (SA)					P1	P1	T1	P2	P2	T2	P3	P3	T3
	EOSC 371 (KO)							P1	T1	P2	P2	T2	P3	P3
	EOSC 250? 252? (FH)							P1	T1	P2	P2	T2	P3	P3
	EOSC 222 (PS&SS)							P1	T1	P2	P2	T2	P3	P3
	EOSC 320?							P1	T1	P2	P2	T2	P3	P3
	EOSC 321 (MK)								P1	P1	T1	P2	P2	T2
	EOSC 323? 327?								P1	P1	T1	P2	P2	T2
	EOSC 329								P1	P1	T1	P2	P2	T2
	EOSC 311???								P1	P1	T1	P2	P2	T2
	EOSC 270? (MM)									P1	P1	T1	P2	P2

Courses undergoing transformation w/o specific STLF help

Involves ~60% of EOS faculty as primary instructors, with opportunity for 100% of faculty to be involved in working groups

What we've done so far: Courses

- Draft learning goals for at least 13 courses:
  - EOSC 111, EOSC 114, EOSC 221, EOSC 112, EOSC 210, EOSC 212, EOSC 220, EOSC 223, EOSC 310, EOSC 449, EOSC 324, ENVR 200, ENVR 300
- Data collection:
  - Quantitative: pre-post tests of student abilities
  - Qualitative: surveys, focus groups, interviews
- New pedagogy (and plans for new pedagogy)
- Plans for thorough assessment (the key to approaching teaching science based on science)

EOS-SEI

Plans: Curriculum considerations

- Course-transformation requires defining a course's role in a program/curriculum
  - Departmental structure to define program-level goals
  - Identify links, gaps, overlaps among courses
  - Make recommendations for curriculum changes
  - Make structure sustainable
- CWSEI is an ideal opportunity to examine curricula (human resources to collect and analyze data)
- Starting with service courses:
  110, 111, 112, 114, 116, 310, 311, 312, 314, 315
  (maybe: 210, 211, 222, 250, 252, 270, 324, atsc201)

Our approach: Overarching components

- Student Attitudes about Earth Science Survey
- TA training
  - Improved professional development for grad students
  - Improved education for undergrads
- Dissemination & discussion of ideas:
  - Seminars, brown bags, tips
- Archiving/Sharing resources

EOS-SEI

Attitude Surveys in Earth and Ocean Science

Tom- Pierre Frappe and Ben Kennedy

How do you feel towards this statement

"Learning about attitude surveys is useful in my life"

Novice attitude — Expert attitude

Strongly disagree, Disagree, Neutral, Agree, Strongly agree.

Your opinion is different to actually how useful the attitude surveys really are,

However, your opinion about it will affect how much you will learn about it !

EOS-SEI

Student Attitudes in Earth and Ocean Science

WHY ? Students beliefs and attitudes are a a better predictor of performance in science than the amount of previous science classes.

WHAT ? An online survey for assessing the impact our classes have on students beliefs and attitudes relative to an expert.

HOW? By comparison of answers on identical surveys at the beginning and end of the semester.

WHERE ? Originally developed at Colorado University for Physics and Chemistry. The negative shifts in student attitudes were hugely influential for driving educational reform at Colorado.

NOW- Earth and Ocean Sciences and other departments at UBC fall 07 and spring 08

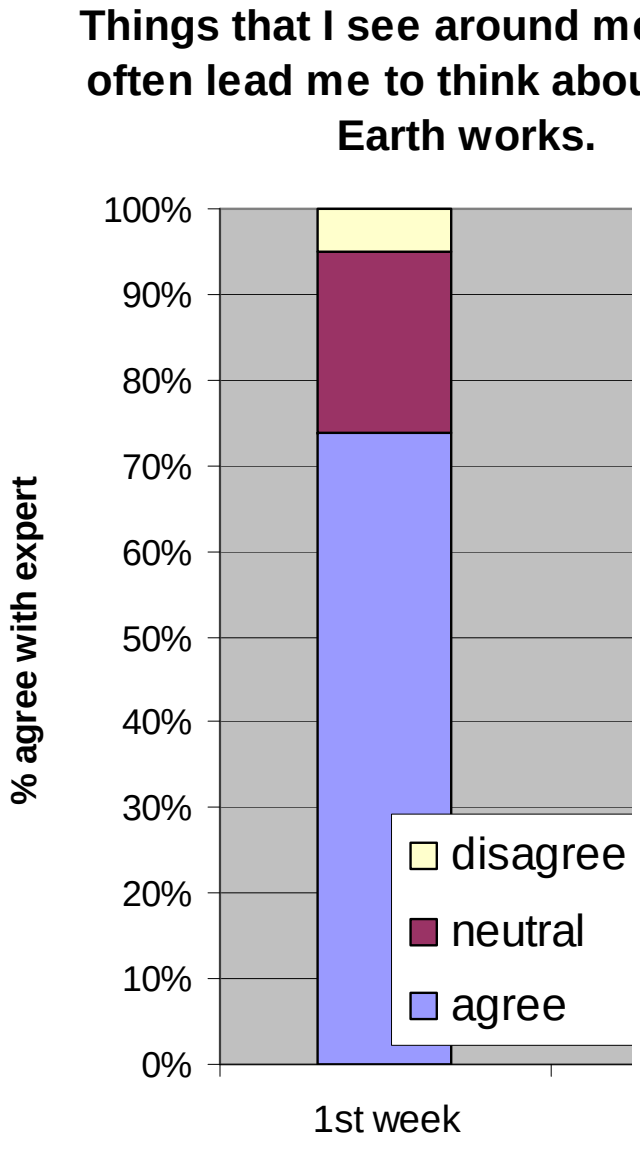
EOS-SEI

Survey Development Process, 18 months in

1. Finding out what student scientific beliefs were important to Earth and Ocean Scientists.
2. Adapting the existing physics survey to address these beliefs.
3. Validation- student interviews to assess whether these statements were clear.
4. Running the survey, collecting, and analyzing the results.
5. Validating expert opinion
6. Reworking and improving questions with Colorado who are also working on an Earth Science survey

EOS-SEI

Results- Spring 08 Response comparisons
Eg From category "Connection to real world"

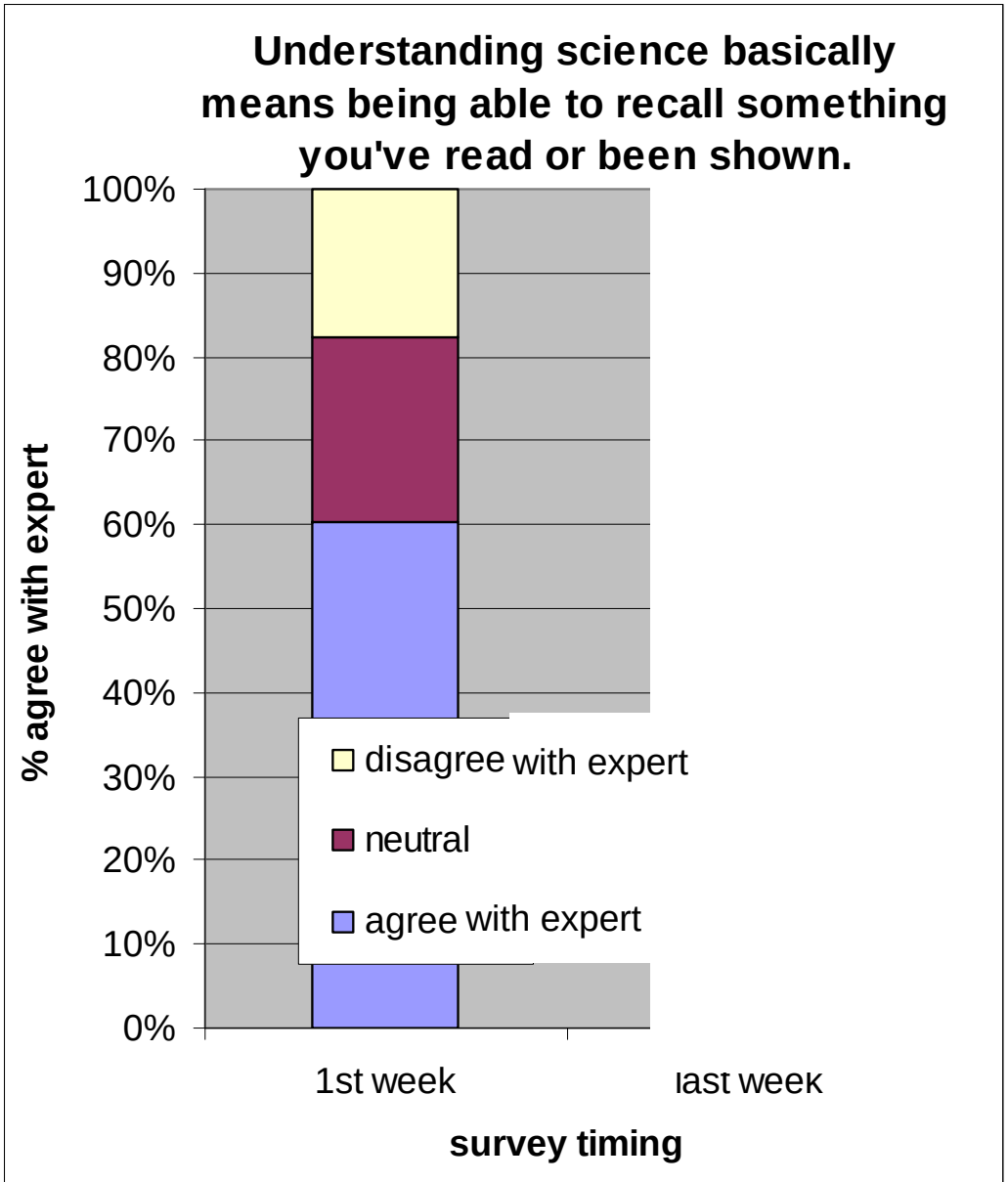


800 students
11 classes
37 questions
6 question categories

Plotted as "Agreement with expert opinion"

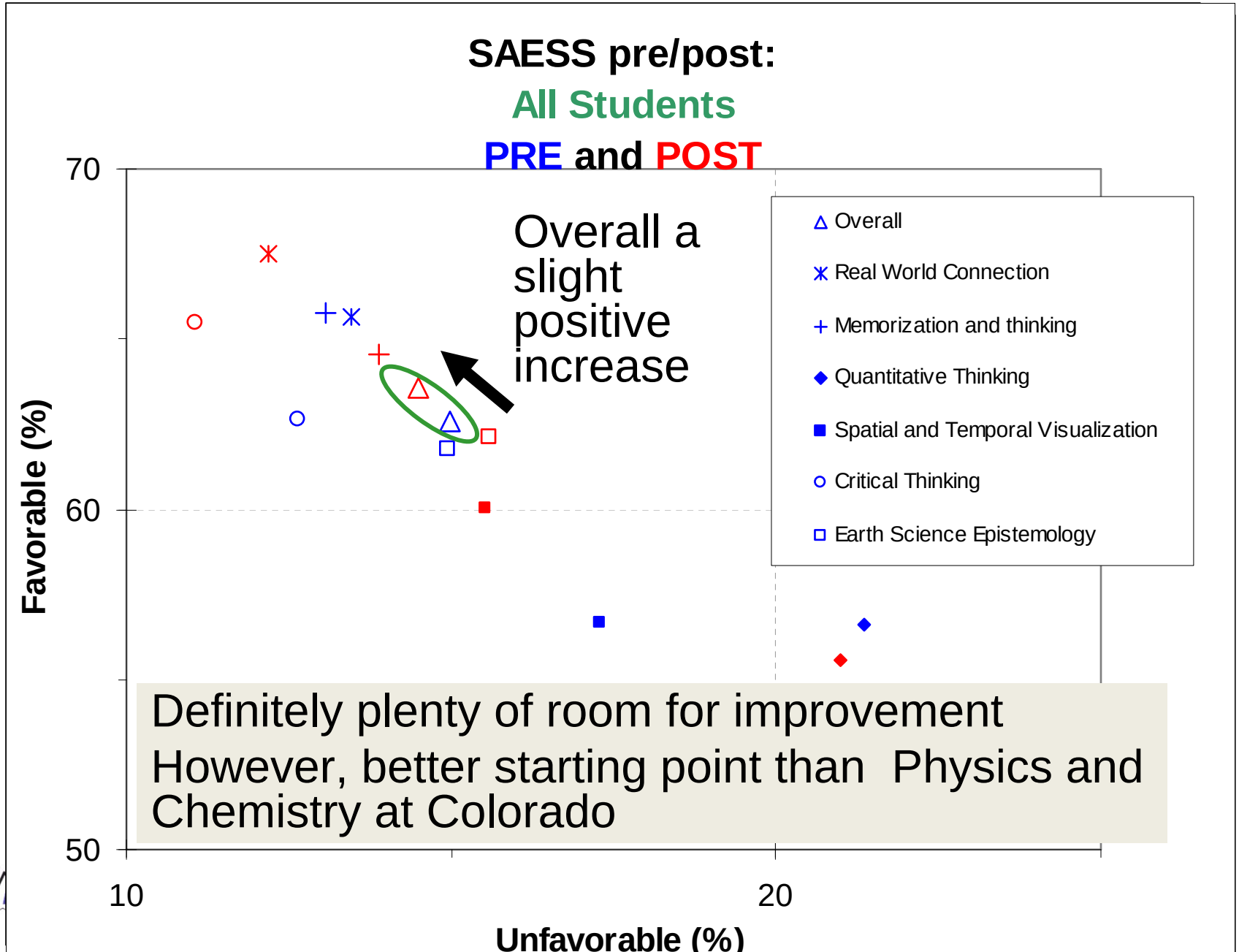
Initially high belief in the real world connection of geology

Results- Spring 08 Response comparisons Memorization and thinking



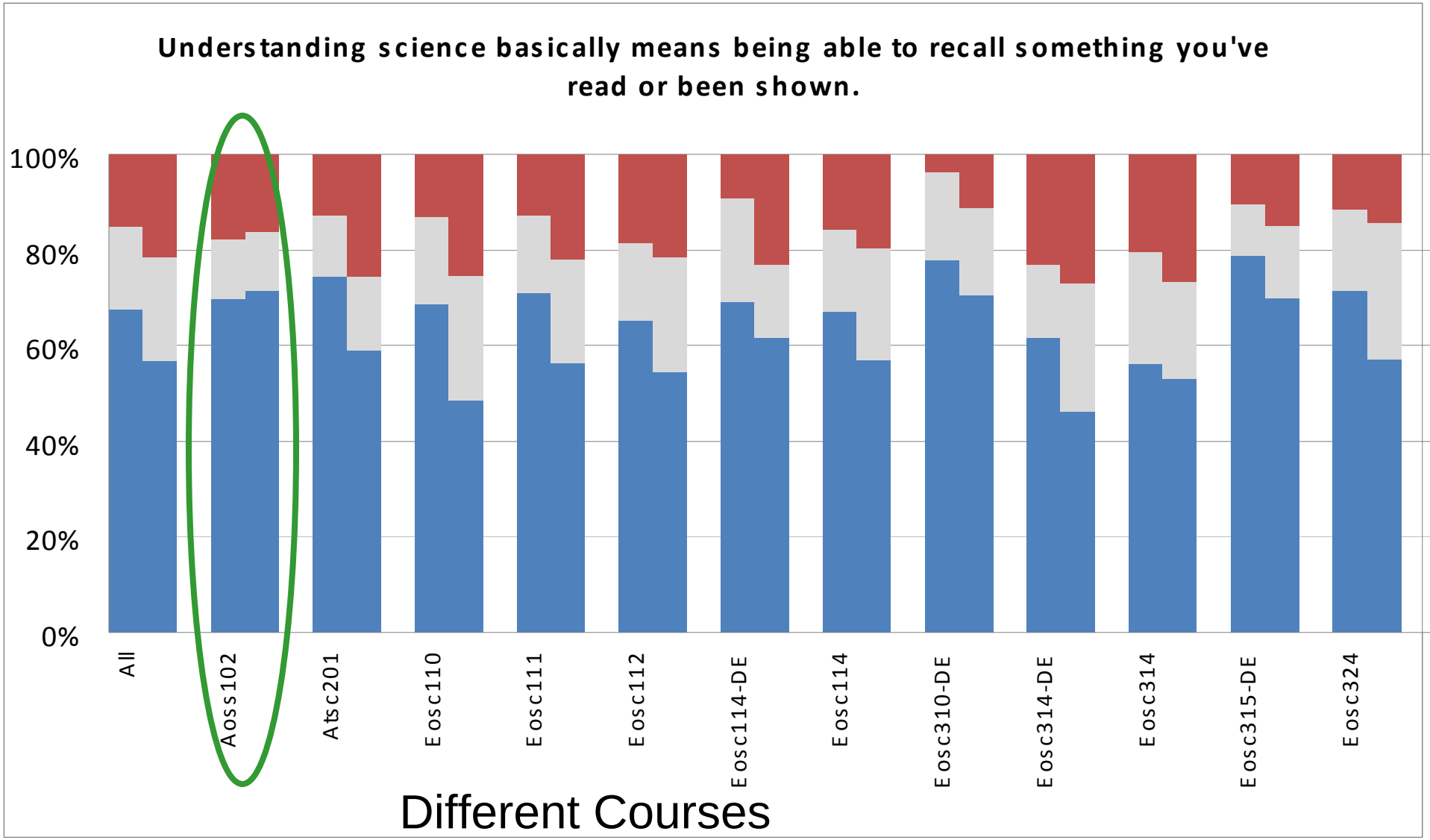
After a semester of Earth Science classes, how is this opinion affected ?

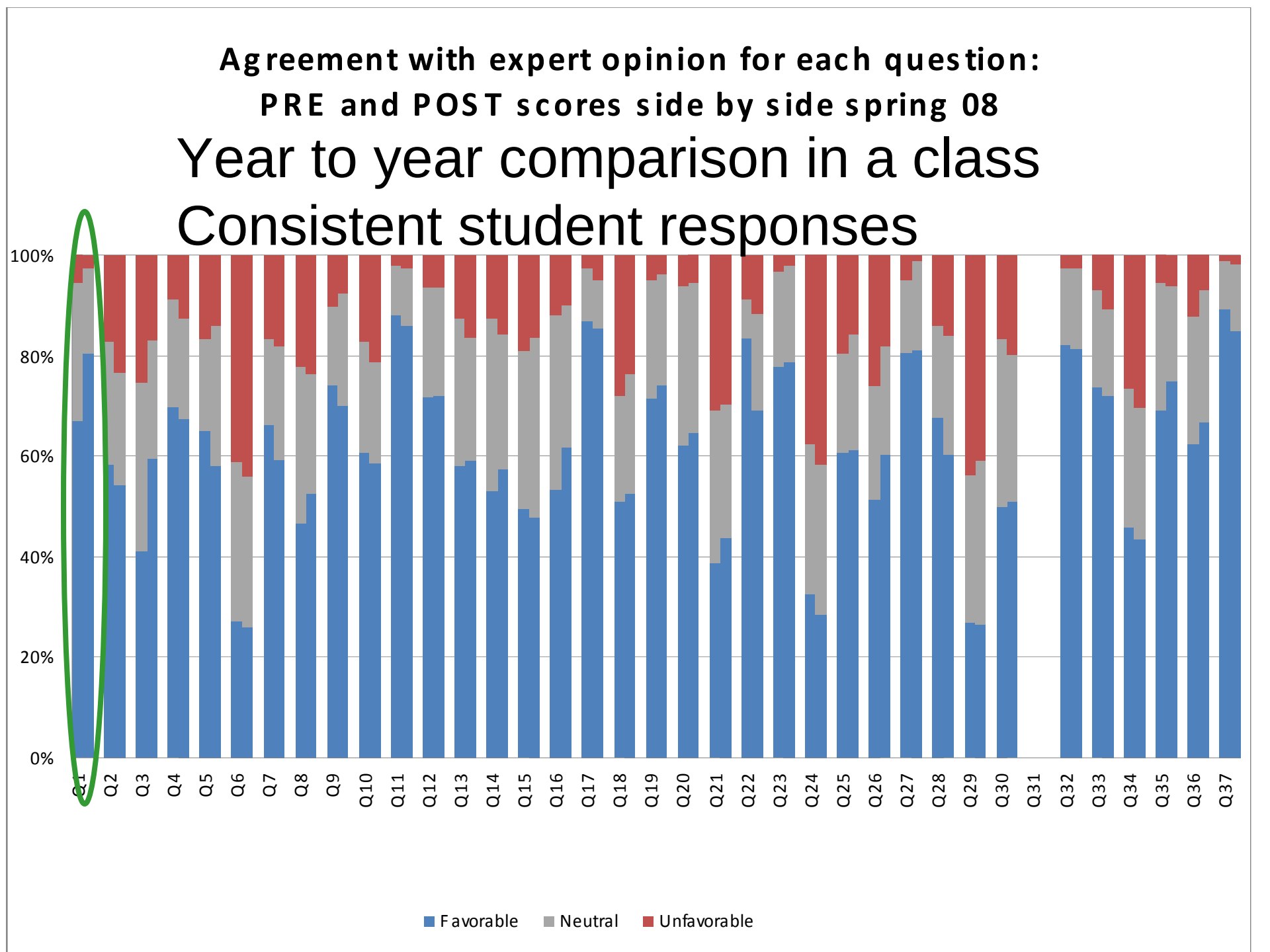
Categories- representing 5-8 questions



Course comparison- Any course stand out ?

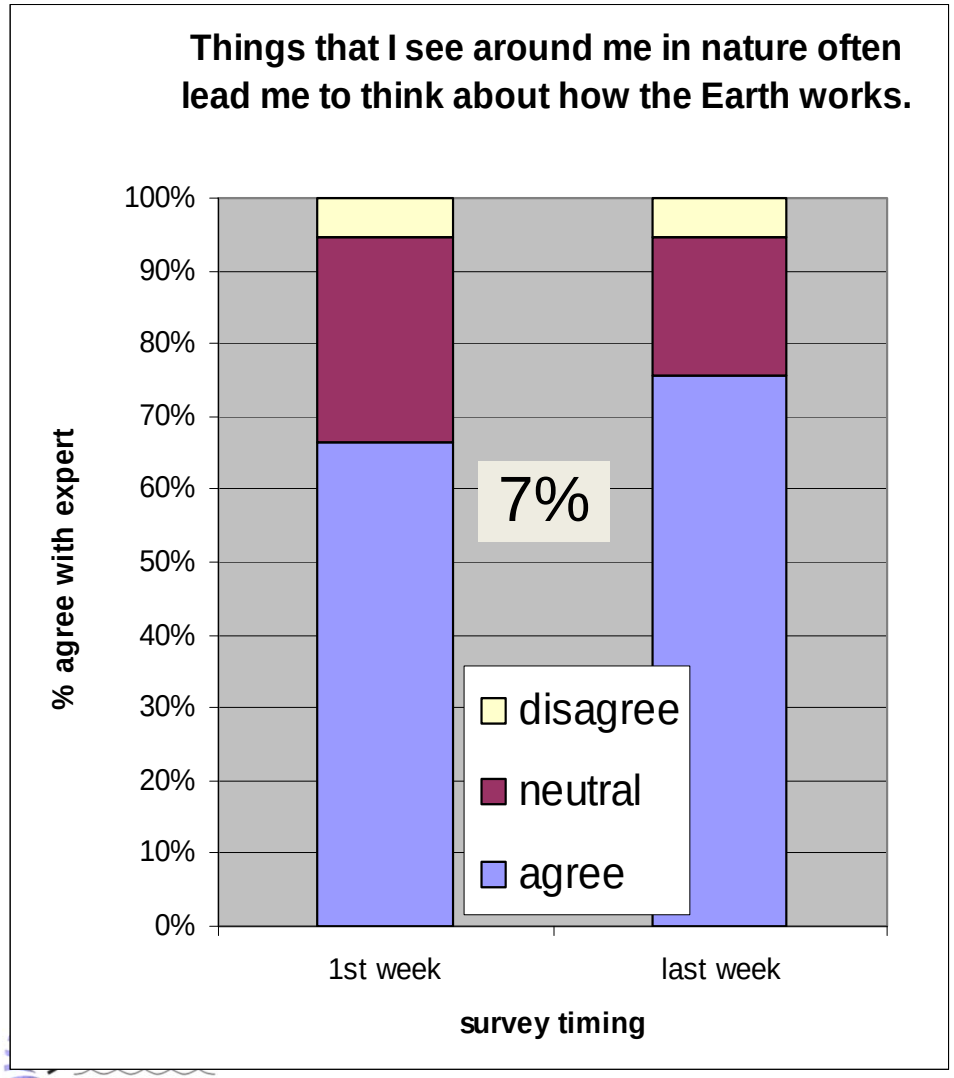
What is this course doing that we are not ?



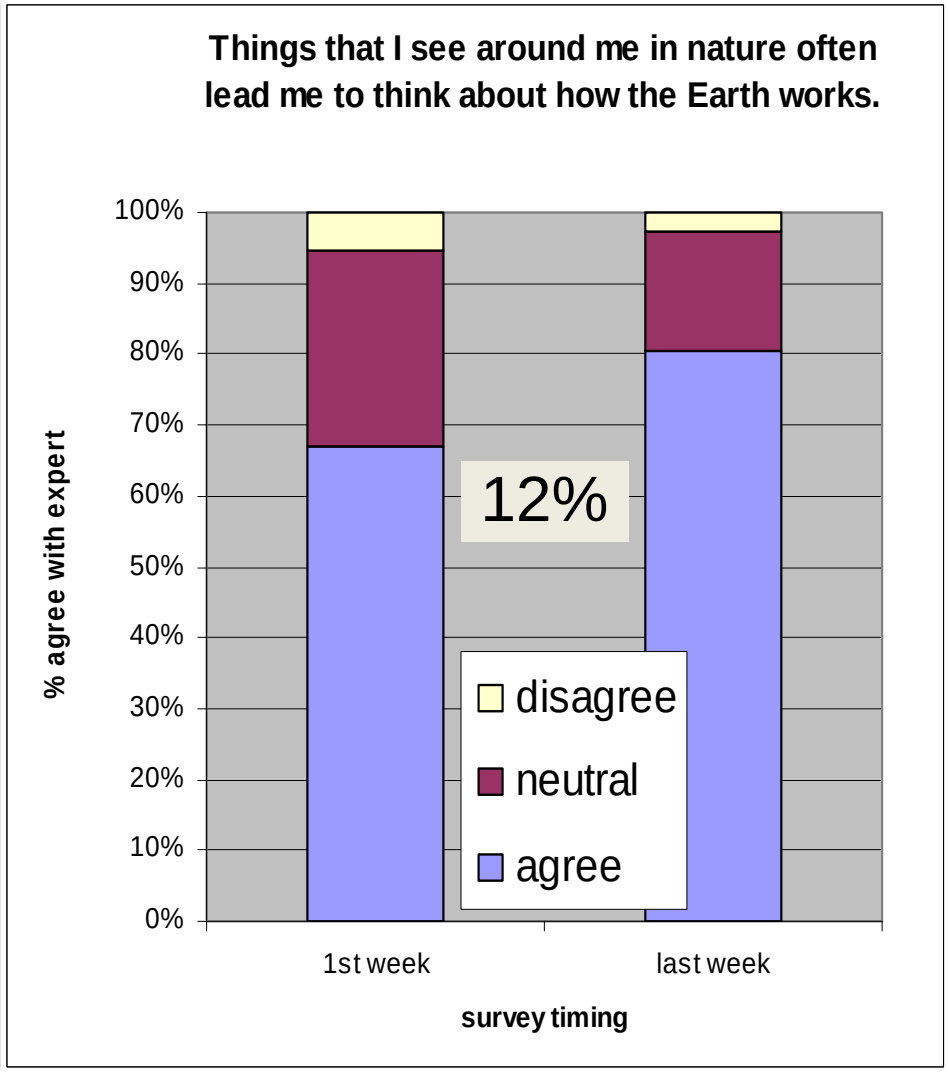

Agreement with expert opinion for each question:
PRE and POST scores side by side spring 08
Year to year comparison in a class
Consistent student responses
100%
80%
60%
40%
20%
0%
Q1
Q2
Q3
Q4
Q5
Q6
Q7
Q8
Q9
Q10
Q11
Q12
Q13
Q14
Q15
Q16
Q17
Q18
Q19
Q20
Q21
Q22
Q23
Q24
Q25
Q26
Q27
Q28
Q29
Q30
Q31
Q32
Q33
Q34
Q35
Q36
Q37
Favorable
Neutral
Unfavorable

Year to year comparison EOSC 114

Fall 2007



Spring 2008



Attitude Survey Summary

- Student attitudes and beliefs towards EOS showed a 0-2 % positive shift which differs from initial published results from Physics and Chemistry at Colorado that showed a 5-10 % negative shift.
- We should be aiming for large positive shifts in student attitudes in all categories
- The survey highlighted particular attitudes that can be concentrated upon for course improvement.
- The survey highlights courses that are positively effective and negatively effective in changing student attitudes.
- The survey highlights positive and negative changes in courses over time.

EOS-SEI

How do you feel towards this statement now ?

“Learning about Attitude surveys is useful in my life”

Strongly disagree, Disagree, Neutral, Agree, Strongly agree.

Faculty – STLF interactions

Handout: General model for STLF-Faculty member interactions (C. Wieman)

- Who
- Learning goals
- Assessments
- Resources
- Sustainability
- General timing

Interaction between Faculty, Department, Students, TAs, C. Wieman, other STLFs …

These are highly case-specific.

But guidelines are an excellent starting point.

EOS-SEI

Faculty – STLF interactions

At EOS:

- Teaching faculty
  - Buyouts … provides (some of the) necessary time.
  - Actions: initial goals, assessments, activities, content …
- STLFs:
  - Advice, edits, recommendations based upon …

    data acquisition (observations, interviews, etc. etc.) & analysis
  - Implement, collection, analysis of evaluation of efforts.
  - Contribute (growing) knowledge about learning & pedagogy.

EOS-SEI

EOS-SEI Year 1 Progress in EOSC114

Earth and Ocean Sciences – Science Education Initiative.

April 28, 2008

Outline

- EOSC114
- Course transformation context
- Process
  - Examples of effort to date
- Aims for the September 2008 fall term
- Faculty experiences during the process

EOSC114:
The Catastrophic Earth - Natural Disasters

- First offered Fall ’01
- Maximum No. students
- Minimum cost of delivery
- Intro. to Earth, Ocean, Atmospheric Science
- Highlight EOS Faculty and research areas

- Fall ’06: Begin increasing activity in lectures (clickers).

EOS-SEI

EOSC114: Course transformation context

- Very popular
  - 2005W: 785
  - 2006W: 826 + 211 Distance Ed
  - 2007W: 809 + 320 Distance Ed

- Efficient & Effective
  - Lecture style: 6 modules; 4-5 instructors;
  - Assessments: 2 midterms + final exam, all multiple choice.
  - Drop-in centre with graduate student TAs.

Poster Presentation

Balancing the diverse goals of a large team-taught first year science course

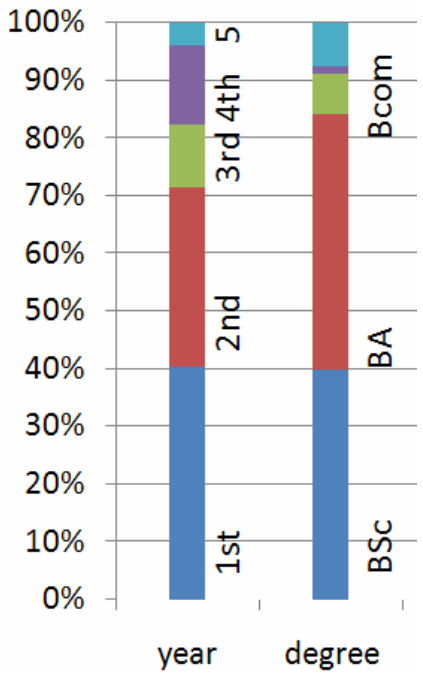
F. Jones, R. Stull & J. Caulkins

23rd Annual Conference of the SoTL in Higher Education, UBC, June 2003.

EOS-SEI

EOSC114: Course transformation context

- What needs modifying?
  - Learning & assessments are very "passive".
  - Continuity and consistency are challenging with multiple instructors.
  - Needs, prior knowledge, and abilities of different student groups: a trade-off.
    - B.Sc.
    - B.A.
    - EOS degree programs
    - Data from Spring 2008 EOT.



Course transformation process for eosc114

1. Learning about the course and student's needs
2. Goals (course and module)
3. Assessments of learning, keyed to goals
4. Active learning and feedback, including:
   class time, homework, resources.
5. Measuring effectiveness
6. Sustainability of initiatives

1. Learning about the course & student's needs

- Observations of class in acition
  - Example next slide
- Interviews with instructors (not "discussions")
  - "What challenges do you perceive with this course?"
- Interviews / focus groups with students
  - Example next slide
- Past assessments
  - Assignments
  - Class activities (clickers, others …)
  - Tests – aligned with apparent goals?

EOS-SEI

Example of observations

- Simple coding helps.
- Focus on specific issues chosen by instructor.

- Example later if interested.

SH. 2008-03-28

- 09:03:35 after my request for help and the instructor evaluations announcement.
- doing rogue waves.
- NB - handed out about 10 cards by wandering around the class.
- sitting in front helps see up the class. A good change from sitting in the back.
- Again, note how settling doesn't finish until 09:06:11 or later. Implications is keep content 'trivial" for that period. Include this in large lecture guidelines.
- View from the front: surprisingly not full - maybe less than half. The chattering and most people are in the upper half.
- TODO - IDEA maybe we should do all lecturing from up on the mid-level. This means we must supply remote slide advancers.
- Missed an opportunity for humor when mentioning wreck beach and "geology"
- Too much time on groins? maybe not since the handsup pole was 50-50 split. Evidence for an extra clicker question.
- clicker - no talk first. everyone in front is looking up and thinking. Good split of answers. Pair share for the next part produced a better result.
- Current events - the Longisland case. 09:25:17
- The wave over wall clip caused some chatter - should we make use of that? Should each video always cause some discussion? Inquiry based thinking?
- Clicker survey about climate change. I wonder if another option (other than A) could be "Humans are solly responsible for it" ??
- The antarctic & greenland plot with it's graph is very complicated! Jargon = eustatic.
- So is the next slide. It's an "odd" graph. Not sure I understand the two bars ...
- Concept of prediction and envelopes is "important"? test it? complex graphs etc. What was actually learned by students? what did they really think about it all?
- Was the connection between global climate and shorelines made explicite? Not sure ...
- Clicker - I did notice that some those who were asleep woke up for the questions. Defense of the answers doesn't seem to work (again). However the range of options was OK. I guess saying "any thoughts about answer A" doesn't work so well because the thought has already been done. I do like all right except one option.
- 09:47:23 - still struggling to finish. The final map was rushed.
- Last clicker survey at 09:47:58. People are deffinately packing up. But it retain themk better than otherwise.
- IDEA So yes, put a no-stress question in at the end. We do have to manipulate the class time to squeeze out the first and last 5 minutes. Also we do need to make these steps consistent for all instructors and so students know what to expect.

Example of interviews / focus groups

- Regarding EOS service course curriculum:
  - WorkStudy: 2 focus groups (6 stds) & 10 interviews.
  - Strive for consistent data without "discussion".

QUESTIONS	Positive	Neutral	Negative	Notes
1				
2				

- EG: When asking about what students did not enjoy:

  …and with me I thought I could just do the readings because the lectures were so similar to them and there wasn't much new stuff in class that I couldn't have just studied on my own at home.

EOS-SEI

2. Goals (course and module)

- For instructors: learning goals workshop
- Course level
  - Initial attempts
  - Iteration
- Module level
  - Range of Bloom's Levels
  - All cognitive domains
    (cognition, metacognition, psychomotor, affect)
- Lesson level goals are more "moveable"
- Connection with curriculum

EOS-SEI

Course & module level goals

- EOT survey shows improvement in recognition of goals:

Three questions: Agree or disagree?

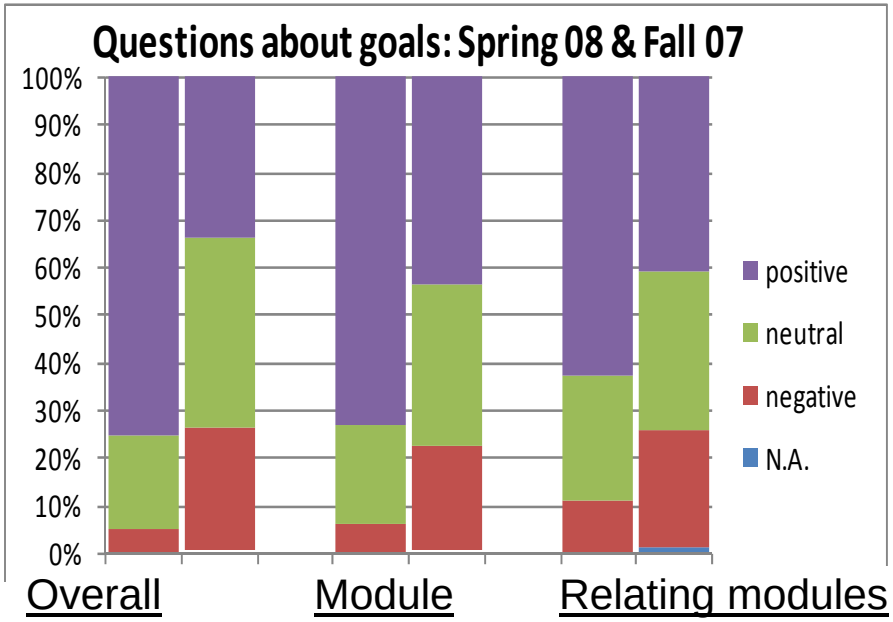
a. Overall learning goals were clearly expressed for the course.

b. Ditto … for each module.

c. Relationship between modules was clear.

» Spring 08 left

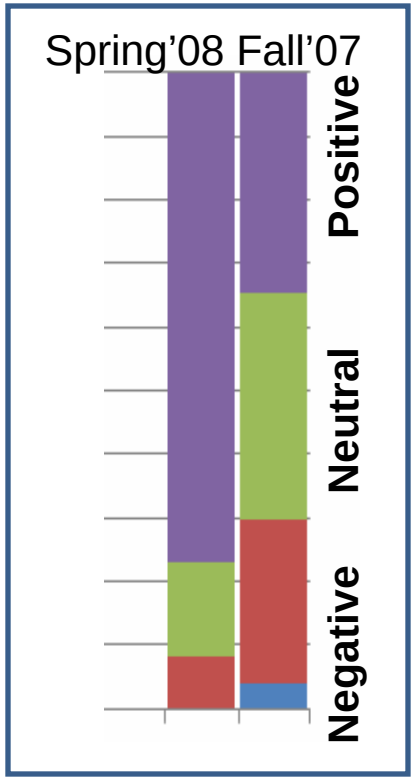
» Fall 07 right.



3. Assessments of learning

- Closely connected with goals
- Integral part of “active learning”.
  - Informs students of progress towards goals
  - Instructors see areas needing support.

- Tests / Exams
  - No surprises for students
  - Range of cognitive domains and Bloom’s levels that match those of goals.
  - Improved from F’07 to S’08 (EOT):
    - *“The grading system is adequate.” (two midterms and a final exam)*
    - BUT … student “likes” & “best practice” are not always the same …?



Course transformation process for eosc114

1. Learning about the course and student's needs
2. Goals (course and module)
3. Assessments of learning, keyed to goals
4. Active learning and feedback, including:
   Class time, Homework, Resources.
5. Measuring effectiveness
6. Sustainability of initiatives

4. Active learning: Class time

- When instructor can be useful.

  Quote from EOT comments:

What are things you really like about this course?

"PRS and how 2 instructors would go over confusing aspects at the begging of each of the classes."

and

"the enthusiasm of the teachers and the way they took feedback and responded the next class."

EOS-SEI

Active learning 1: Class time

- When instructor can be useful
  - Clickers: many uses, but non-trivial to do well.
  - Alternative activities:
    - 5-min projects
    - Questions on paper
    - Many other ideas in the literature
  - JiTT: Just in time teaching (www.teachingdvd.com)
    - (Video examples of pedagogy are **very** helpful.)
  - "Disaster scenario" day.
    - Observations show this was highly effective.

EOS-SEI

Active learning 2: Homework

- Readings, Pretests, Bulletin board activity, etc.
- Assignments to increase “depth” and provide ownership of content.

- Requires
  - Management
  - Coupling with class work (JiTT)
  - Time (e.g. better use of TAs)

Active learning 3: Resources

- Clickers
- WebCT
- Questions bank or database (*SkyLight grant*)
- Text book. Was poorly integrated into the course.
  - EOT: 70% disliked it or were neutral
  - EOT: 90% LIKED or neutral re. notes on web
- NEW: custom text
  - All instructors agreed – R. Stull will implement ASAP.

EOS-SEI

Course transformation process for eosc114

1. Learning about the course and student's needs
2. Goals (course and module)
3. Assessments of learning, keyed to goals
4. Active learning and feedback, including:
   class time, homework, resources.
5. Measuring effectiveness
6. Sustainability of initiatives

EOS-SEI

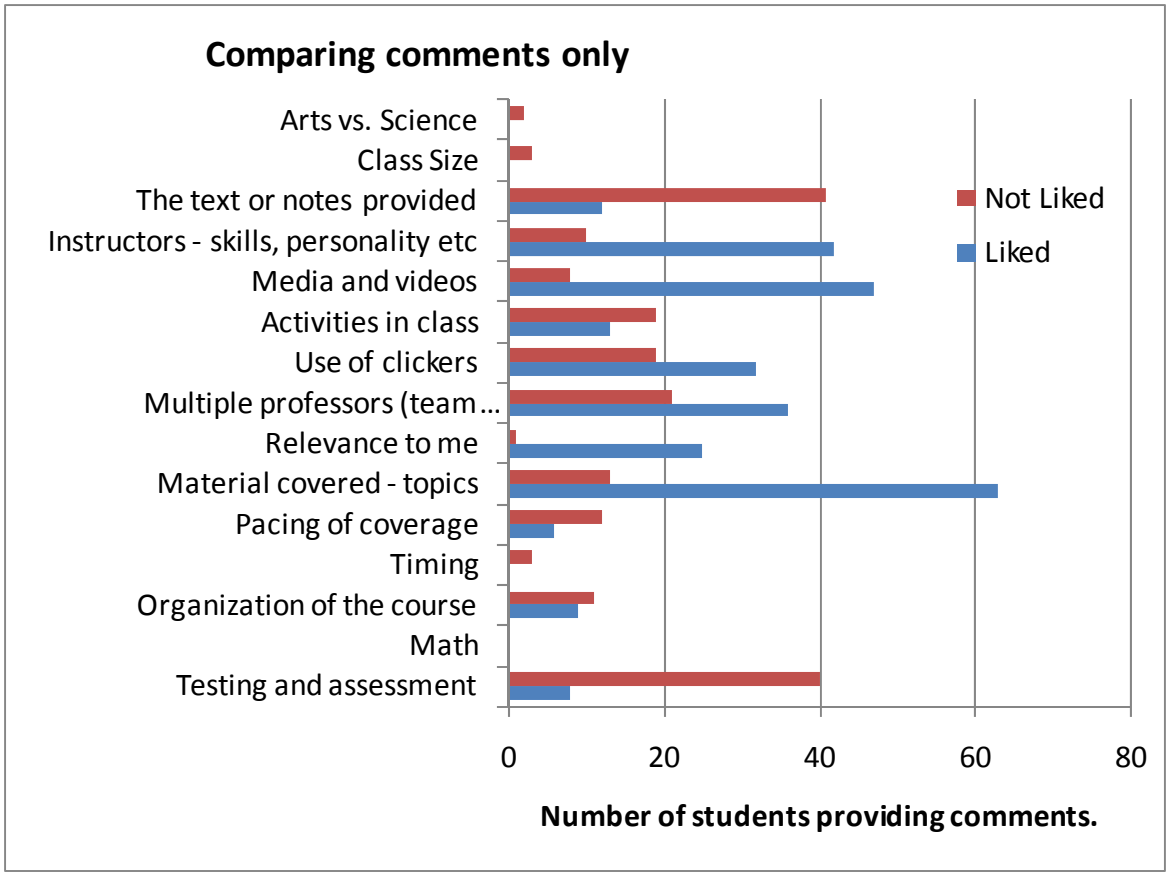
5. Measuring effectiveness of initiatives

- Comparing the current to the "optimal" course
- Analyzing assessments
  - Comparing to previous terms
    - Specific questions.
    - "Level" or complexity of questions that are being asked.
  - Analysis of how "maturity" changes during term
    - Requires product from students, and analysis time
  - Specific pre-post questioning strategies.
- Carefully prepared EOT surveys
  - Use precedent about surveying (eg SALG instrument)
  - Evolve towards long term consistency
  - Example: Spring 2008 summary pdf.

EOS-SEI

5. Measuring effectiveness of initiatives

- Example of EOT comments (203 of 348 students)
- Look for what was “liked” and what was “not liked”



6. Sustainability of initiatives

- Faculty become more *expert* about learning and pedagogy
- Procedures & tools
  - Eg. **Questions Database** (*SkyLight grant*)
  - Eg. Streamlined administrative procedures (Vista??)
- Archiving and transfer
  - CWSEI archiving project: Content & Pedagogy

EOS-SEI

Aims for the September 2008 fall term

In progress – priority list by 1st quarter of May

- All instructors need to be involved. Hence time buy-outs
- Recommendations: priorities based upon S.W.O.T. summary
- SWOT to be built by mid-May based upon
  - all class observations,
  - Interviews & Focus groups (WorkStudy assistant)
  - Assessments – clickers and exams
  - End Of Term surveys from Fall'07 and Spring'08.

EOS-SEI

Aims for the September 2008 fall term

Opportunities for research …. (very tentative)

- Evaluate initiatives related to JiTT
  (use of *Vista*, BB use, QuestionDB, transfer to new instructors, etc)
- Study questions that students pose.
- Observe improvements in …xxx… from early to late in the course.
- Compare sophistication of tests / activities / questioning to previous yrs.

EOS-SEI

Faculty perspective

- Roland Stull

People involved so far... at a minimum...

TIC & 1º instructors	Sara Harris, Mary Lou Bevier, Jim Mortensen, Greg Dipple, Douw Steyn, Phil Hammer, Tom-Pierre Frappe, Erik Eberhardt, Francis Jones, Brett Gilley, Ben Kennedy, Mark Jellinek, Roland Stull, Michael Bostock, Roger Francois, Stuart Sutherland, Stuart Mills, Lee Groat, Uli Mayer, Maya Kopylova
Working Groups & Other	William Hsieh, May Ver, Kurt Grimm, Mark Bustin, James Scoates, Ken Hickey, Lori Kennedy, Dominique Weis, Susan Allen, Maite Maldonado, Kristin Orians, Kelly Russell, Philippe Tortell, Paul Smith, Mati Raudsepp
Grad students	Peter Lelievre, Melissa Gray, Jackie Dohaney, Leigh Gurney, David Cassis, Brendan Smithyman, Mark Halverson, Chris Leslie, Kirsten Hodge, Alyssa Shiel, Mika McKinnon, Danny Bay, Holly Peterson
Under-grads	Jamil Rhajiak, KC Smith, Ryan Harvey, Jonathan Elmer, 111 students, 221 students (past & present), also hiring now for summer Skylight/EOS-SEI project

EOS-SEI

Plans for the future

- Continue work on course transformations
- Continue work on Attitudinal Survey
- Continue developing TA training program
- Serious effort toward examining curricula
- Work on archiving and effective transfer of materials to new instructors
- Expand seminars/discussions – visibility, maximize departmental involvement

…a work in progress…

EOS-SEI

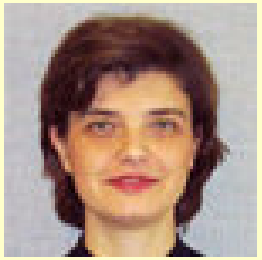
Life Sciences Carl Wieman Science Education Initiative

Who are we?

Tamara Kelly, Ph.D.
STLF

Harald Yurk, Ph.D.
STLF

Jared Taylor, Ph.D.
STLF



Gülnur Birol, Ph.D.
Skylight Associate

Many faculty and students

Life Sciences Carl Wieman Science Education Initiative

What should students learn?

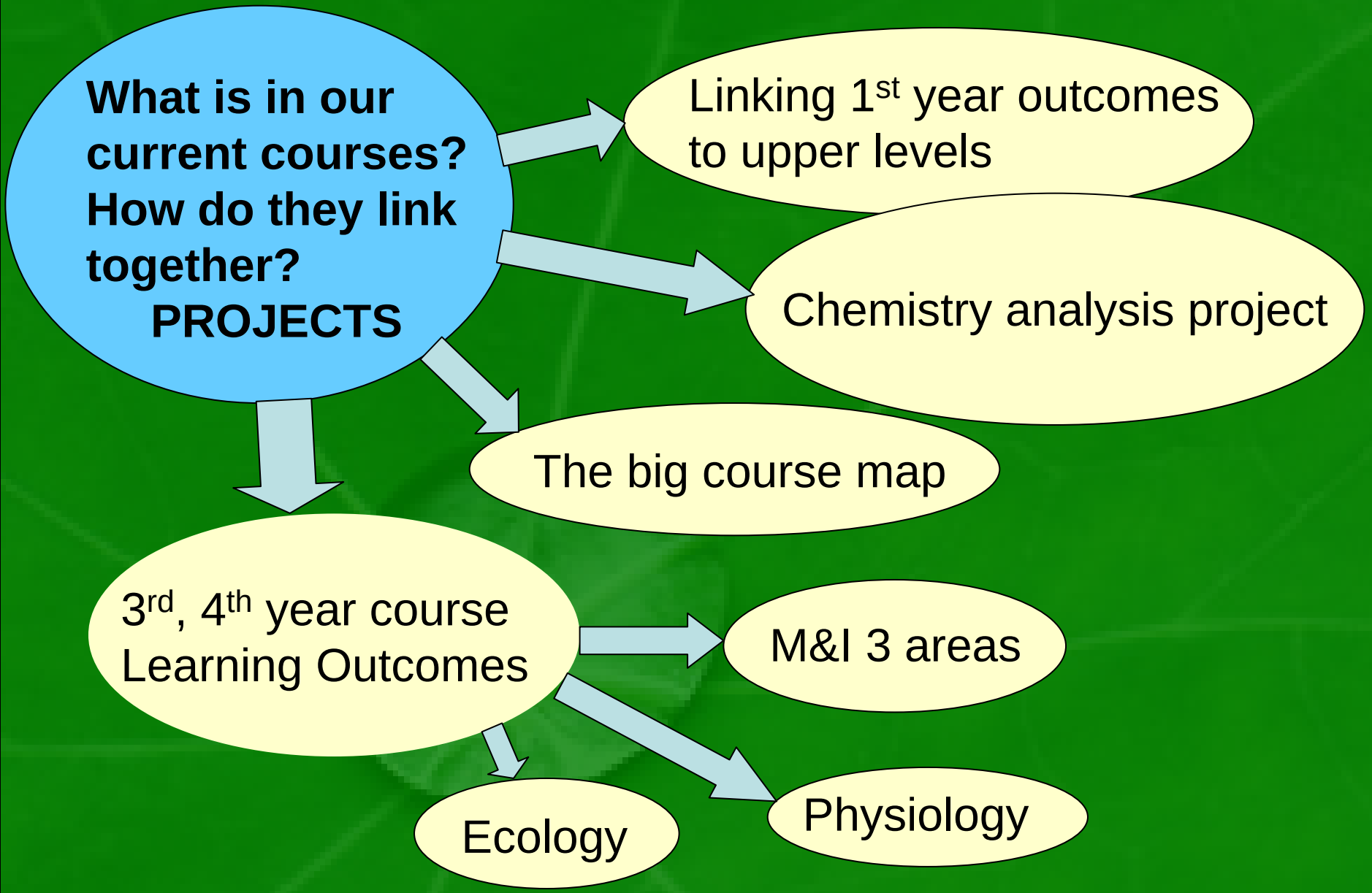
What are students learning now?

What improves student learning?

What are we
trying to accomplish?
Do we know how well
our courses “work”?
Who “are the students”?

What is in our
current courses?
How do they link
together?

Transforming courses:
Active learning,
Evidence based
assessments

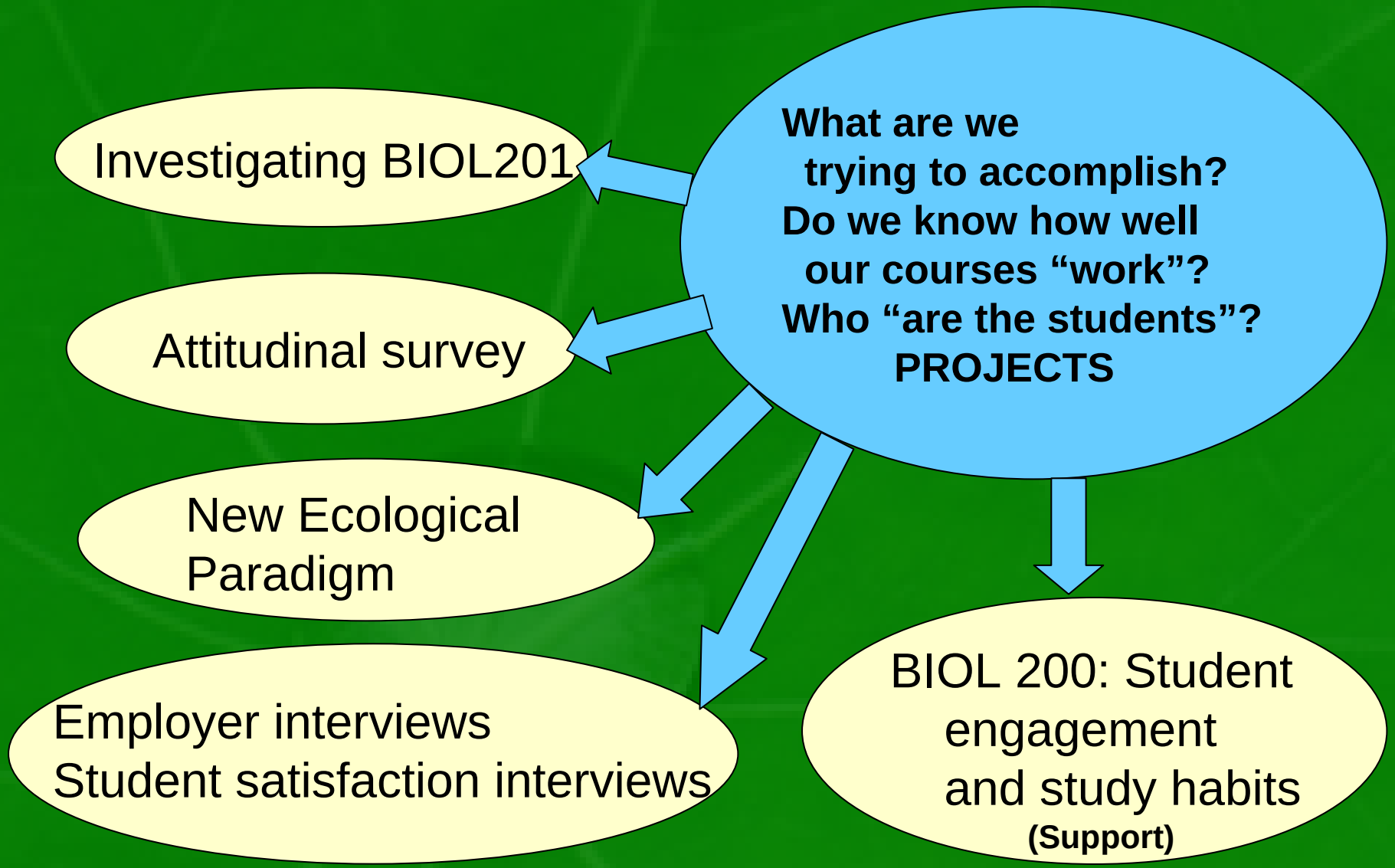

What is in our current courses? How do they link together?
PROJECTS
Linking 1st year outcomes to upper levels
Chemistry analysis project
The big course map
3rd, 4th year course Learning Outcomes
M&I 3 areas
Physiology
Ecology

What is in our current courses? How do they link together? PROJECTS

Chemistry analysis project
Lots of faculty
Jared Taylor

Examine course notes for chemistry concepts.

Example: BIOL 361
- Laws of Thermodynamics
- Entropy
- Free energy and reaction coupling
- Free energy of equilibria


What are we trying to accomplish?
Do we know how well our courses "work"?
Who "are the students"?
PROJECTS
Investigating BIOL201
Attitudinal survey
New Ecological Paradigm
Employer interviews
Student satisfaction interviews
BIOL 200: Student engagement and study habits
(Support)

Investigating BIOL201

Sunita Chowrira Botany
Jeff Richards Zoology
Wade Bingle M&I
Jared Taylor

What are we trying to accomplish?
Do we know how well our courses "work"?
PROJECTS

800 students (4 sections).
Introduction to proteins, enzymes, ATP synthesis.

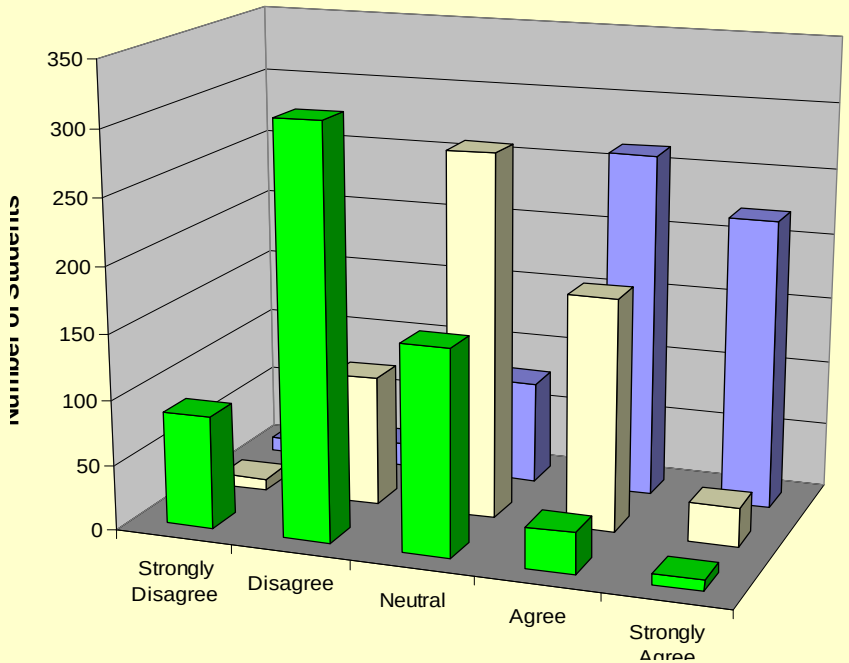
1. Chemistry Pre-test.
2. Student focus group interviews.
3. Follow-up Survey.
4. PRS question database (on-going).

Investigating BIOL201

Follow-up Survey

What are we trying to accomplish?
Do we know how well [illegible]rk"?

Follow-up Survey Question Examples



- Lectures cover previously learned material too often
- The PRS questions are quite challenging
- Lectures are useful for learning the Biology 201 material

What are we trying to accomplish? Do we know how well our courses "work"? PROJECTS

Attitudinal survey

James Berger (Zoology) Gulnur Birol (Biology and Skylight)
Jennifer Klenz (Biology) Tamara Kelly (CWSEI-LS)
Michael Murphy (M&I) George Spiegelman (M&I)
Kathy Nomme (Biology) Joanne Nakonechny (Skylight)
Carol Pollock (Biology) Ellen Rosenberg (Biology)
1st 2nd year instructors in BIOL111, 112, 121
Lots of 1st and 2nd year students

Attitudinal survey

What are we trying to accomplish? Do we know how well our courses "work"? PROJECTS

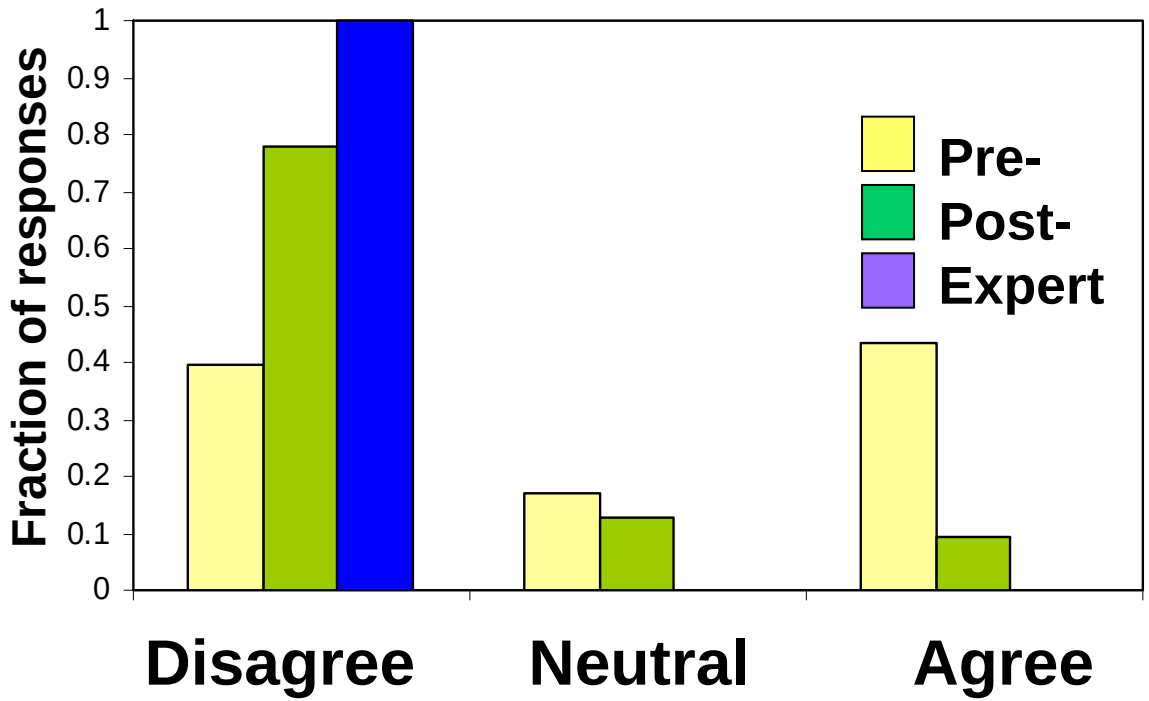
1. Piloted in BIOL111, BIOL112, BIOL121 term 1, 2007/08
2. Questions revised.
3. 2nd run BIOL112, BIOL121 BIOL201 term 2, 2007/08 (data available in June).
4. Collecting responses from experts.
5. Collaborating with CU Science Education Initiatives.

Results from BIOL 111

Attitudinal survey

What are we trying to accomplish? Do we know how well our courses "work"? ECTS

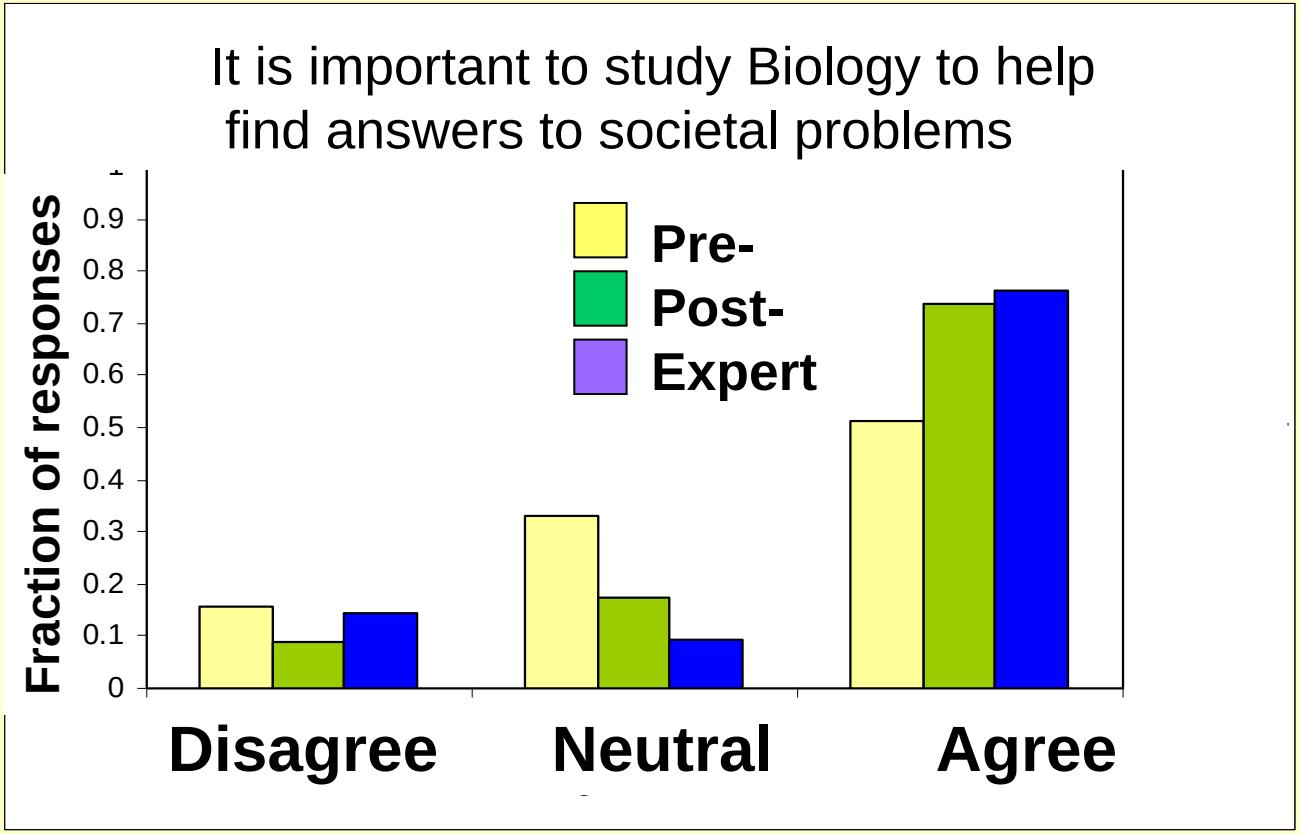
Learning Biology that is not directly relevant to or applicable to human health is not worth my time.



Attitudinal survey

Results from BIOL 111

What are we trying to accomplish? Do we know how well our courses "work"? CTS



New Ecological Paradigm
Faculty teaching ecology
Harald Yurk

What are we trying to accomplish? Do we know how well our courses "work"? PROJECTS

Assess whether respondents view that their existence embedded is in the natural environment.
Survey given to 1st, 3rd, 4th year students.

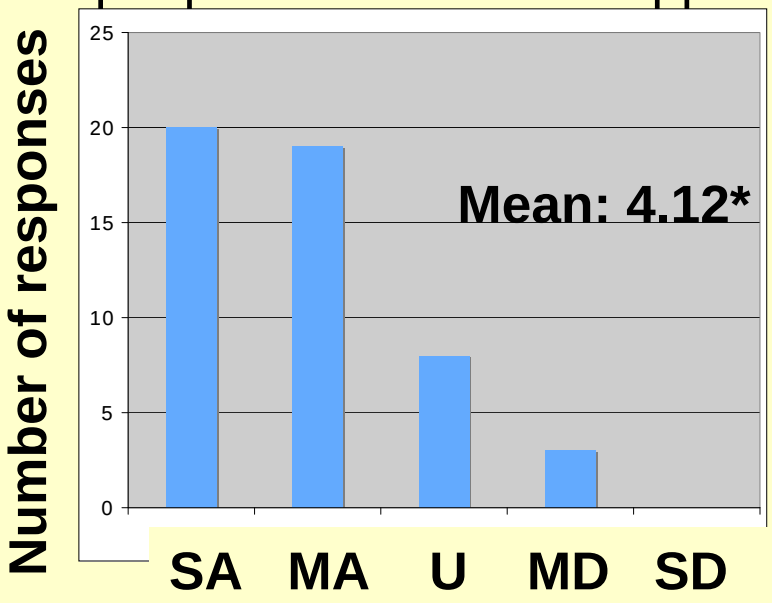
Journal of Social Issues, 56: 425-442 (2000).

New Ecological Paradigm

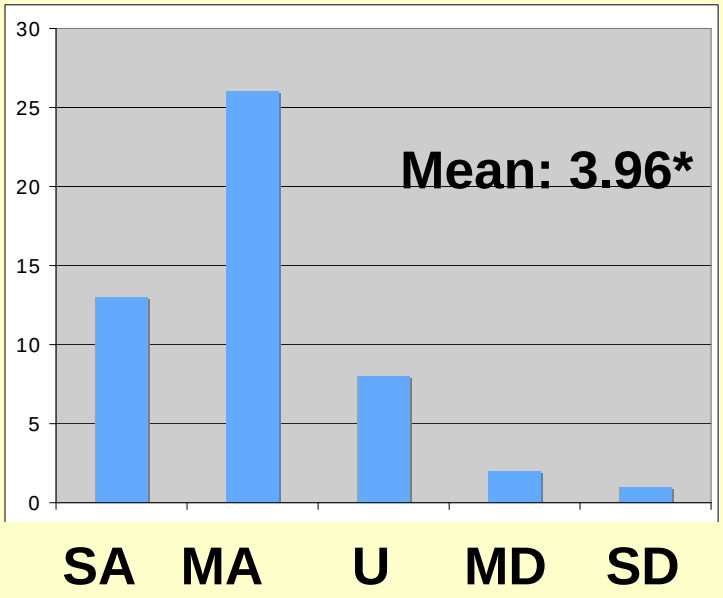
1st year students

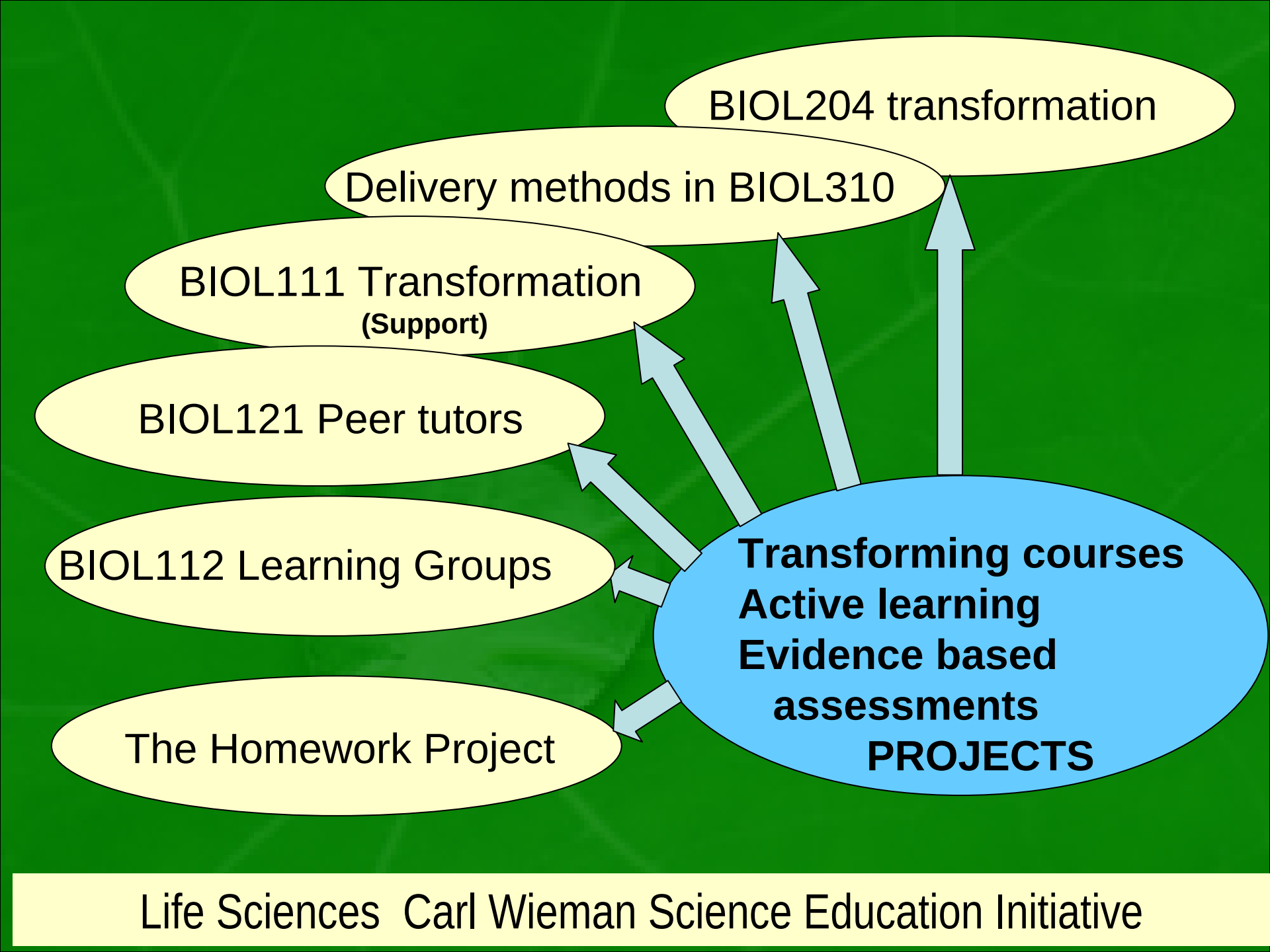
What are we trying to accomplish? Do we know how well our courses "work"? PROJECTS

We are approaching the limit of the number of people the earth can support



The earth is like a spaceship with very limited room and resources




BIOL204 transformation
Delivery methods in BIOL310
BIOL111 Transformation
(Support)
BIOL121 Peer tutors
BIOL112 Learning Groups
The Homework Project
Transforming courses
Active learning
Evidence based
assessments
PROJECTS

BIOL204 transformation

Angie O'Neill

Bill Milsom

Faculty teaching physiology

Transforming courses
Active learning
Evidence based assessments
PROJECTS

The Goal: Shift the focus of class from passive to active learning.

Emphasis on problem solving and case studies.

Shift from memorizing anatomical detail to investigating relationship with more emphasis on physiology and biomechanics.

BIOL204 transformation

Transforming courses
Active learning
Evidence based assessments
PROJECTS

THE PLAN

1. Write learning outcomes for courses that use BIOL204 as a prerequisite.

2. Revise learning outcomes for BIOL204.
3. Write pre- and post- conceptual tests.
4. Write problems and develop case studies.
5. Write exams that evaluate the new learning outcomes.
6. Revise the lab manual to reflect the changes.

Delivery methods in BIOL310

Leticia Avilés Zoology
Jessica Purcell, Zoology
Harald Yurk

Transforming courses
Active learning
Evidence based assessments
PROJECTS

3rd year course, 40 students
Topic is animal behaviour

Goal: compare efficacy of: 1) lecture without group discussions and 2) group discussions without lecture.

Method: Analysis of homework for evidence of using conceptual context and interviews for attitudes towards delivery modes.

BIOL112 Learning Groups

Transforming courses
Active learning
Evidence based assessments
PROJECTS

Karen Smith M&I
Tracy Kion M&I
Julyet Benbasat M&I
Tamara Kelly
Gulnur Birol

Does a small group learning environment aid students' conceptual understanding?

BIOL112 Learning Groups

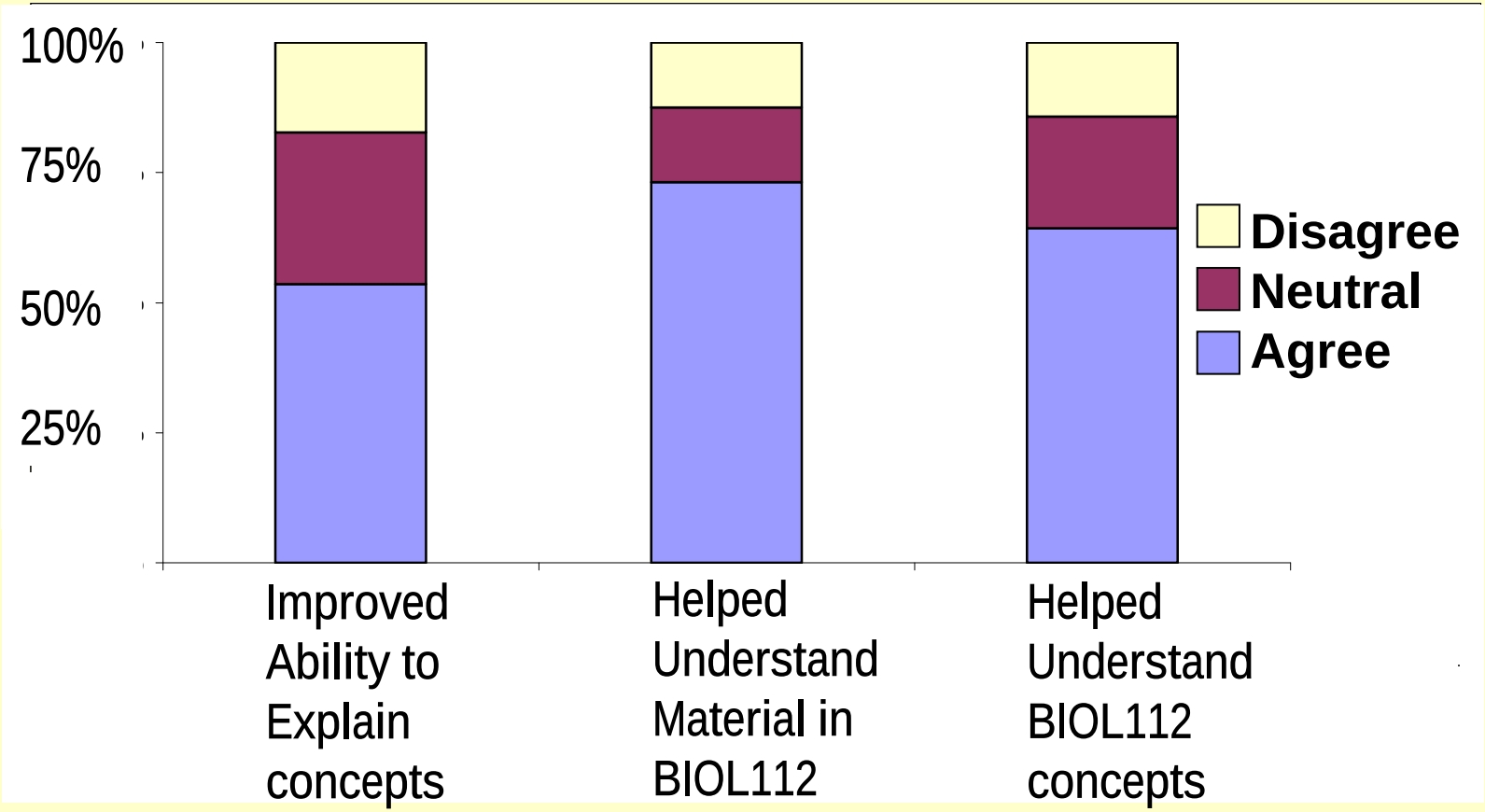
Transforming courses
Active learning
Evidence based assessments
PROJECTS

1. 50 minutes sessions. Students in groups of ~5.
2. Work on conceptual problems derived from existing problem sets and exams.
3. TA-facilitated. 8 sessions.
4. Earn 3% (class participation) mark if attend all 8 sessions
5. ~ 300/1700 students volunteered
6. Analyze using comparison of marks, student focus group interviews, and surveys.

BIOL112 Learning Groups

Transforming courses
ctive learning
Evidence based
assessments

Survey data



Transforming courses
Active learning
Evidence based assessments
PROJECTS

The "Homework Project"

Rosie Redfield Zoology
Tamara Kelly

Purpose:

To determine if weekly assignments improve students' conceptual understanding of BIOL121 material.

To determine if online assignments that incorporate writing result in:

Increased conceptual understanding

Improved writing on short-answer exam questions

The global problem

Many students can't write, and their science classes don't help.

The local problem

BIOL 121 has no resources for teaching writing or for grading homework.

(no TAs and no tutorials)

9 sections, ~200 students/section

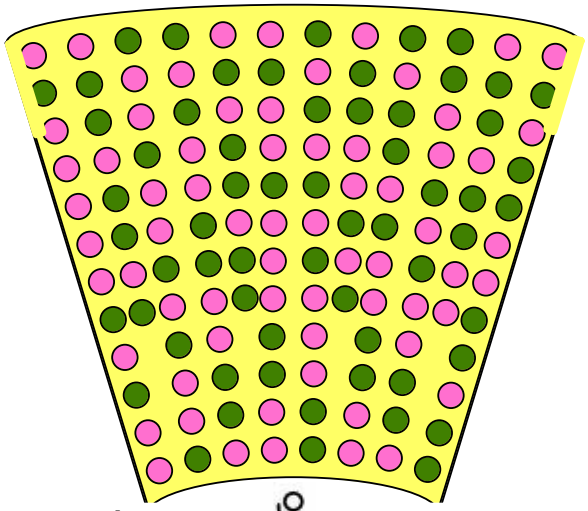
The question(s)

Does written rather than multiple-choice homework

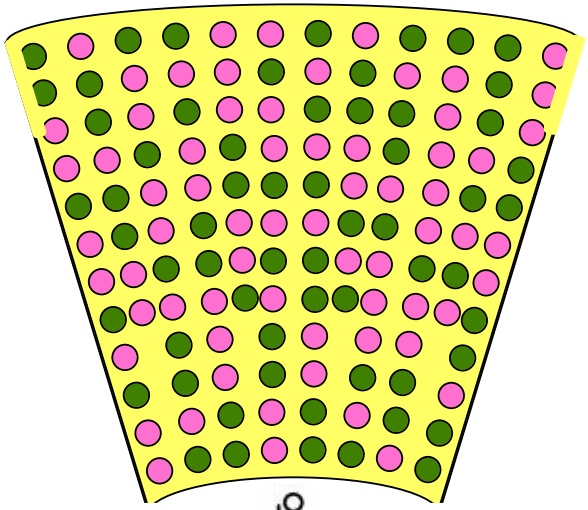
1. Improve students writing ability?
2. Improve students' understanding of concepts?

Previous experiments?

- Poor controls
- Small sample sizes
- Qualitative, not quantitative



Section 223



Section 224

The experiment

Rosie Redfield

Tamara Kelly (STLF)

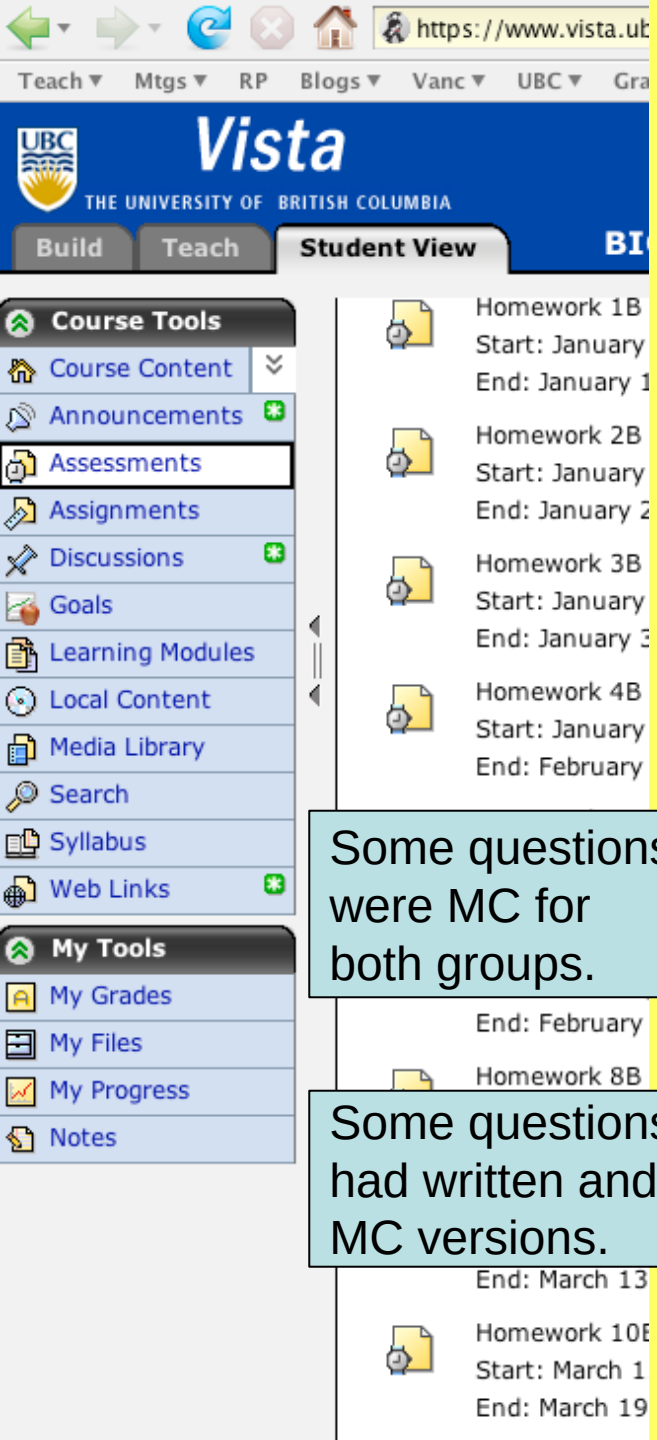
~ 400 BIOL 121 students randomized into two groups:

- written-answer homework (n=189)
- multiple-choice homework(n=193)

- Mixed in the same two sections
- Same instructor (RR)
- Same everything except homework
- Weekly homework assignments delivered as Blackboard quizzes
- No tutorials or TAs

The homeworks

- same readings and instructions
- similar and identical questions



Some questions were MC for both groups.

Some questions had written and MC versions.

Homework 13A (April 2-9)

You're encouraged to discuss the homework assignments with other stu
answers you submit must have been written by you alone.

Answer the questions below in the Homework 13A Questions quiz.

1. Examine Figure 1 (in the separate Figures.pdf file, available on the Week 13 Learning
   which summarizes the pre-farming and post-farming relationship between wild Pacifi
   farmed salmon, and the sea louse *L. salmonis*.
2. Watch the video of fisheries biologist Alexandra Morton addressing the annual genera
   aquaculture corporation Cermac (provided as a link on the Week 13 Learning Module
3. Read the commentary by Lisa Gross (provided as a pdf on the Week 13 Learning Mo

Question 1. Alexandra Morton does not explain to the Cermac AGM why she initially e
salmon farming would benefit wild salmon populations. Which of the listed explanation
(*Multiple choice*)

Question 2. Consider the normal (pre-farm) life history of salmon and sea lice shown in
the absence of salmon farms, what factors prevent wild juvenile salmon migrating to the
exposed to sea lice? (*Answer in a few sentences.*)

Now consider results from the following studies.

Research paper #1. In 2004, Alexandra Morton and other researchers compared the lev
infestation of wild juvenile chum and coho salmon from sites close to farms and from ar

Typical 2-version question:

Question: In the absence of salmon farms, what factors prevent wild juvenile salmon from being exposed to sea lice when they are migrating to the sea?

Writing group: *Answer in a few sentences.*

M-C group: *Choose all that apply.*

1. Juvenile salmon do not encounter adult salmon until they reach the open sea.
2. *L. salmonis* does not survive in fresh water.
3. River flow and tides wash away lice released by returning adult salmon.
4. *L. salmonis* does not attach to juvenile salmon.
5. Adult salmon actively swim away from juvenile salmon.

Example of feedback on content

Question 2. Consider the normal (pre-farm) life history of salmon and sea lice shown in Figure 1A. In the absence of salmon farms, what factors prevent wild juvenile salmon migrating to the sea from being exposed to sea lice? (*Answer in a few sentences.*)

Sample answer: *When lice-infested adult salmon return to rivers to spawn, the fresh water kills their lice and the river flow and tides wash away any surviving lice. When juveniles hatch and migrate to the sea, they rarely encounter adult salmon and so are not exposed to lice.*

Focus:.

Value: 1.0 (0.8 for content, 0.2 for writing)

Feedback:

Good answers should contain:

2a. Fresh water kills sea lice on returning adults.

2b. Near-shore sea lice from last year's adults are washed away by the tides and currents before juvenile salmon arrive.

Common errors:

2c. No points for describing the effects of salmon farms.

Reference: Fig. 1A, Alexandra Morton video.

Standard feedback on writing

Feedback on writing:

A. spelling errors and typos
B. capitalization errors
C. punctuation errors
D. grammar errors
E. word choice errors
F. sentence errors (not complete, run-on)
G. organization of ideas
H. answer not concise or not specific
I. irrelevant information
J. answer does not address question
K. no answer or no explanation
L. writing is sufficiently incoherent that specific errors cannot easily be identified.
M. unacceptable copying from other sources; failure to write in own words
N. answer is not in the form specified (*e.g.* a paragraph is at least three sentences).

Strategies and resources for improving your writing:

1. Read *A Short Guide to Writing about Biology*, especially pages 100-128.
2. Ask a friend with good English skills to read over your answers.
3. Read the information about plagiarism posted in the Resources folder.
4. Compose your answers in Word, with the spelling checker and grammar checker turned on. Word will underline in red every word it thinks is misspelled, and in

The data

How will we measure the effects of the homework types?

On learning of content:

- Scores on the open-book midterm (some written, some MC).
- Answers on ‘test’ and ‘control’ sets of MC questions on the open-book final exam.

On writing ability:

- Writing scores on reading-quiz questions
- Writing scores on written final-exam questions
- Writing scores on project reports (n=~50 in each group)

Effect of M-C homework and of reading-quiz questions?

- Scores on identical essay question in final exams of
- 2007 and M-C 2008 students

Other inputs:

- Survey of all students homework experience
- Focus groups

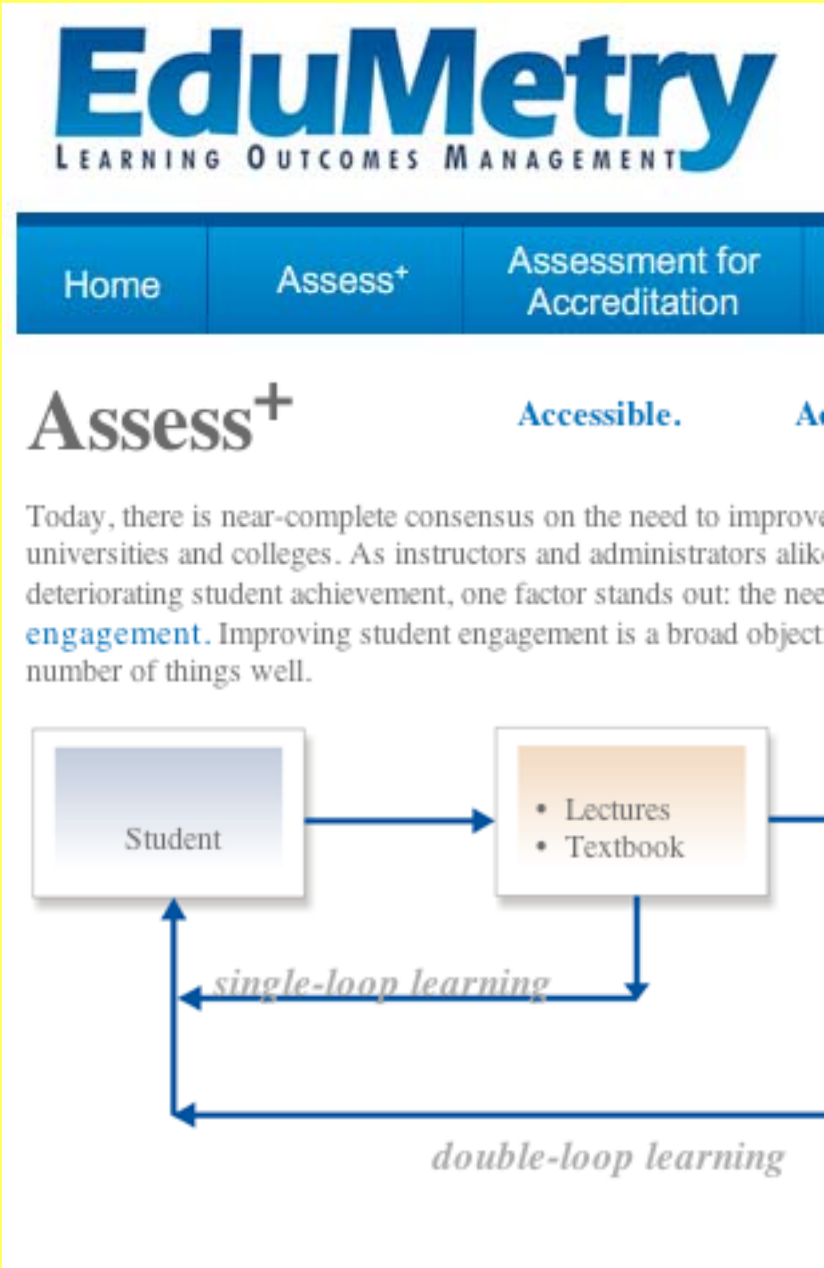
Things that have gone wrong

Edumetry intially offered to do the grading for free, but backed out after the first homework (after grading it so badly that we didn't count the grades).

Returning the homeworks took nearly two weeks.

Most students usually didn't read their homework feedback.

We couldn't integrate our feedback comments into students' answers.



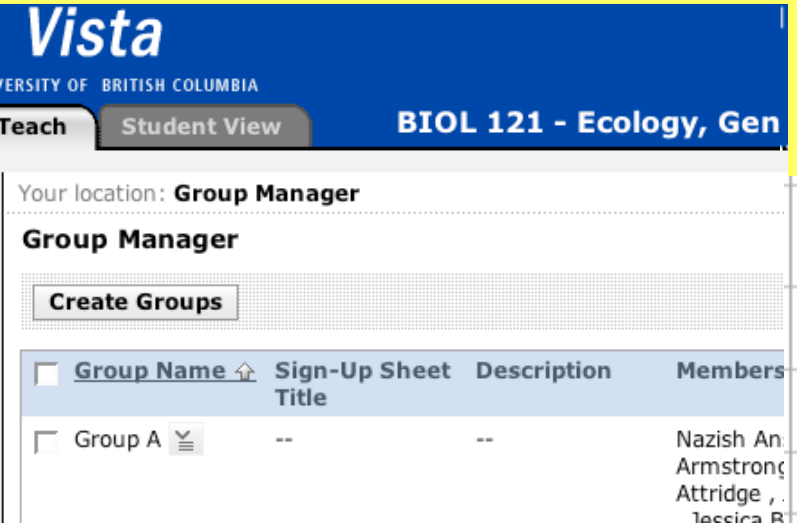
Things that have gone well

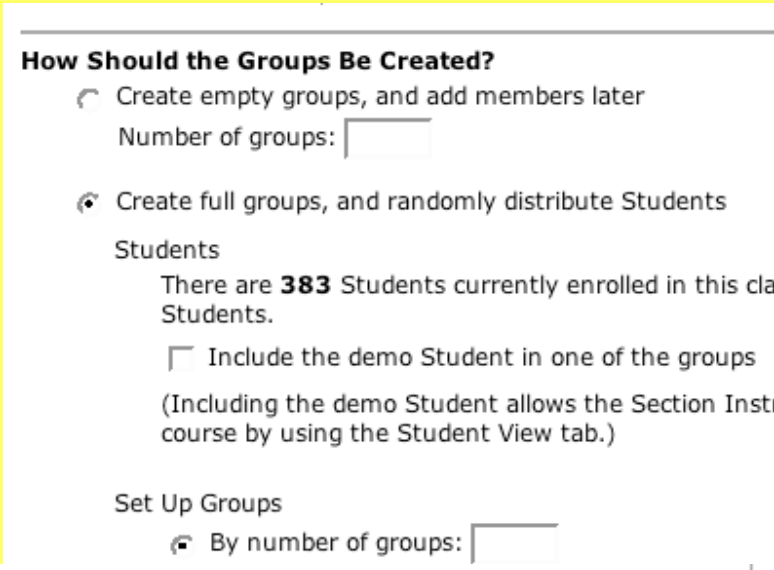
Students didn't mind being part of an experiment (we normalized the grades over the two groups).

We were able to use Vista (Blackboard) quizzes.

Vista creates and handles groups well.

Our grader was excellent.





The costs

Time: Lots

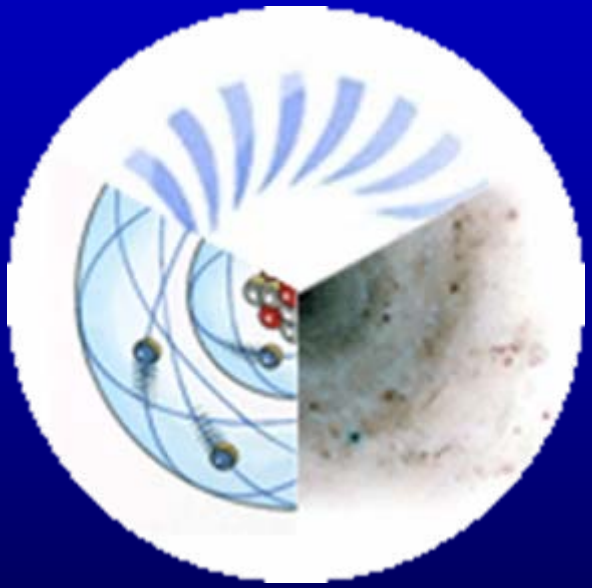
- Developing the homeworks
- Developing the keys
- Developing the exams
- Scoring the writing
- Analyzing the data
- Writing the paper

Money: Not so much

- ~$2500 for the grader
- ~$5000 for assistance with scoring

The Results and Conclusions

Physics and Astronomy Education Projects



Overview

Physics and Astronomy has a long history of exploring innovative ways to teach science. In the last decade, this has included using PRS ("clickers"), computer simulations and Logger *Pro* and more.

In collaboration with CWSEI, we continue to explore and adopt better ways to teach science:

- TA training
- course transformations

PHAS CWSEI Team

Faculty	STLF	Grad Students
Doug Bonn	James Day	Joss Ives
Jim Carolan	Louis Deslaurier	Sandy Martinuk
Andrzej Kotlicki	Joss Ives (Sept, 08)	Mya Warren
Chris Waltham	Peter Newbury	
Jeff Young (Head)		

Teaching Assistant Training

Mya Warren, Joss Ives, Sandy Martinuk, Fran Bates

We have roughly 40 – 50 new TAs every year, the majority of whom are international students.

- They are responsible for the bulk of the teaching in labs and tutorials.
- For many students, TAs are the only face-to-face teaching they get with an instructor.
- In the past, TAs received no job training on coming to UBC.

  This was a frightening experience for new TAs (especially international students unfamiliar with our educational system) and a frustrating one for undergraduate students.

What We Did

In 2007, the Department instituted mandatory TA training for all new TAs:

- The training was created by TAs and is delivered by TAs.
- The focus is on practical skills that they can apply directly to teaching physics and astronomy.
- A 2-day workshop in Sept, 07 had four themes:
  - our experiences *vs.* physics education research
  - instructional tools and techniques
  - student assessment
  - diversity and conflict resolution
- We created a Mentor TA program, where each new TA was paired with an experienced mentor who was available to give advice and who observed their teaching through the Term to give feedback.

TA Training Evaluation

New TAs filled out surveys at the end of…

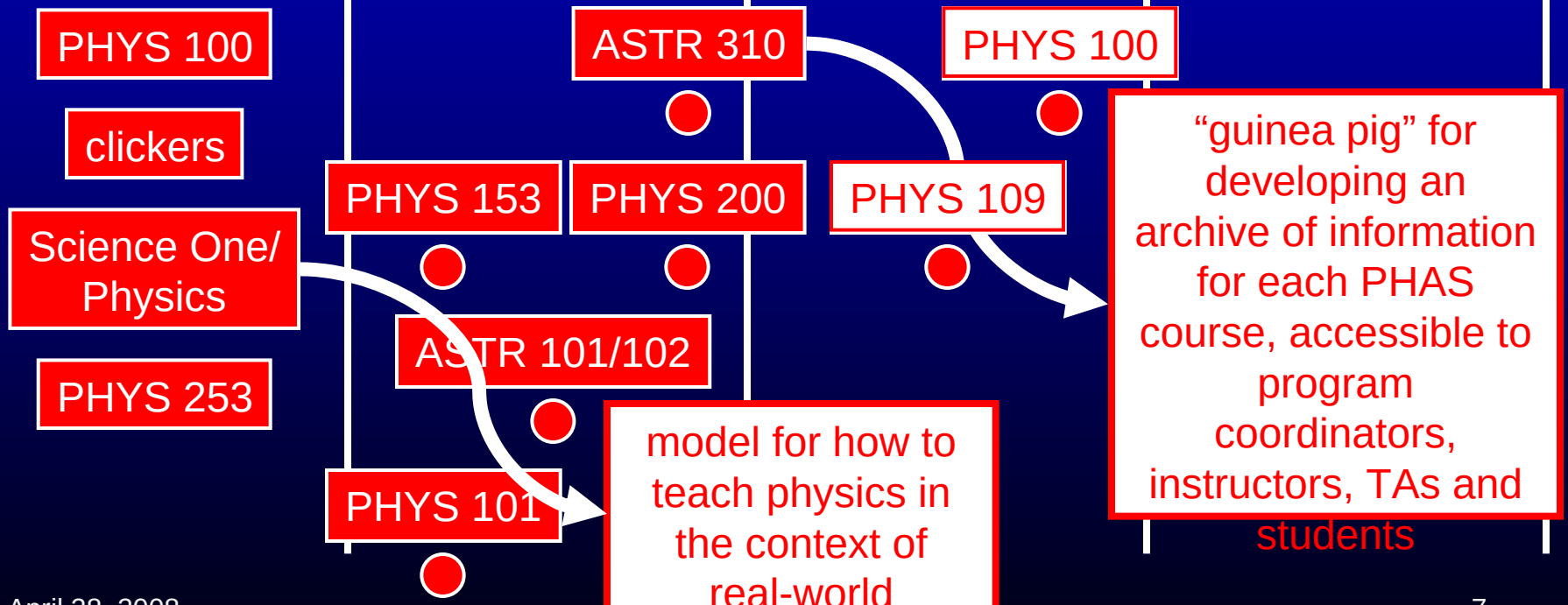
- the workshop Overwhelmingly positive feedback
- the Term There is room for improvement in supporting the TAs during the semester and bringing the workshop and the first year classes into harmony with each other.

We are also looking at the undergraduate student evaluations of their TAs and investigating new ways of evaluating the teaching abilities of the TAs (and hence the effectiveness of the course.)

To learn more about this program, please join the Discussion Session on TA Training at 3:30 p.m.

Course Transformations

Pre-CWSEI	Phase I	Phase II	Phase III
courses and activities prior to collaboration with CWSEI	identify learning goals, student assessment, strategies to evaluate change	implement transformations, collect feedback	evaluate impact of changes, continue to revise course



Transformation of PHYS 100

Andrzej Kotlicki, Sandy Martinuk

PHYS 100 provides an algebra-based introduction to the fundamental concepts of physics such as force, energy, thermal physics, radiation and electricity.

- Audience: Students who did not take Phys 12 in high school: ~ 50% Science, the remainder Arts, Human kinetics, Forestry etc.
- Includes laboratory exercises to familiarize students with the physical phenomena and the basic laboratory instruments commonly used to measure them.

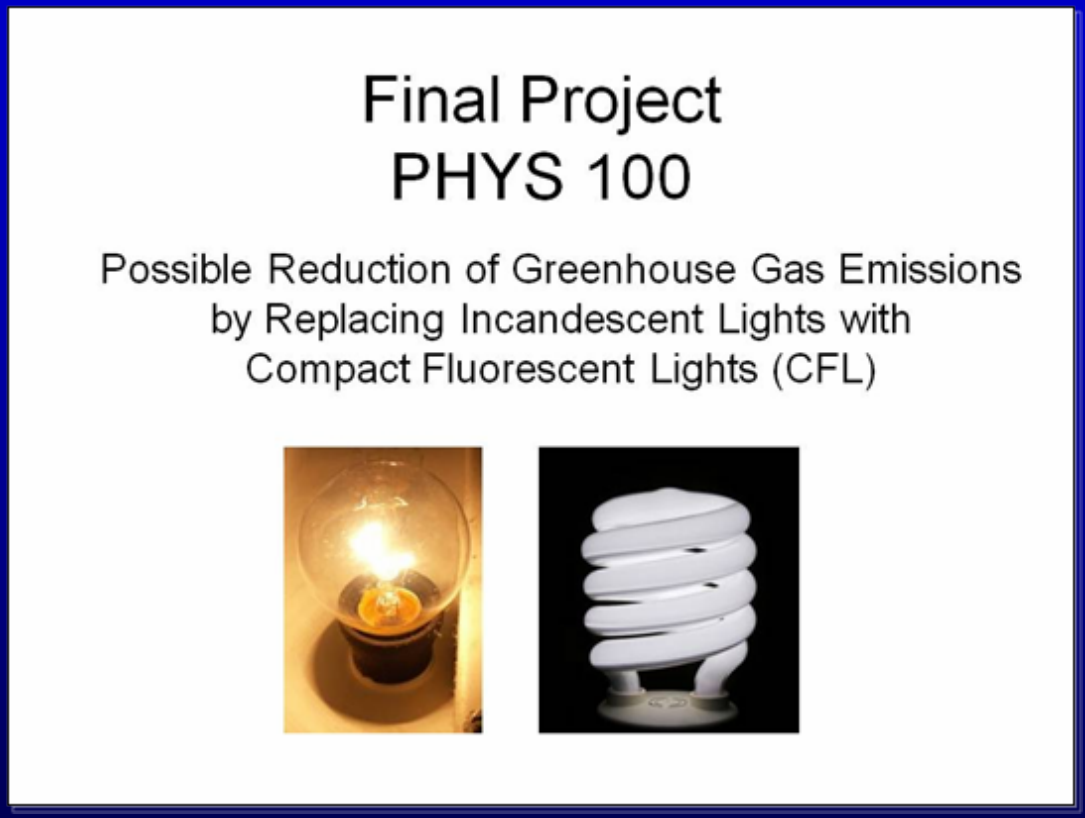
What Was Changed?

In 2007 the course was taught in context of energy production and consumption focusing on three major themes: home heating and climate change; kinematics and transportation; electricity consumption and generation.

- Course and lecture goals were developed.
- The content of the course was adjusted to match the goals and themes.
- The schedule was switched to weekly labs and tutorials (rather than biweekly) to sync the material with lectures.
- The labs were rewritten to more closely follow the scientific method. Several new experiments introduced.
- New tutorials consist of groups of 4 working on a single, context-rich problem with group tests every 3 weeks.

What Was Changed?

- For a final project, student groups researched and presented 10 minutes involving physics-based evaluation of the real impact of some environmental.



Research Assessments:

Colorado Learning Attitudes about Science Survey (CLASS)

We surveyed the students' beliefs about physics.

Question 35: The subject of physics has little relation to what I experience in the real world.

strongly disagree	disagree	neutral	agree	strongly agree

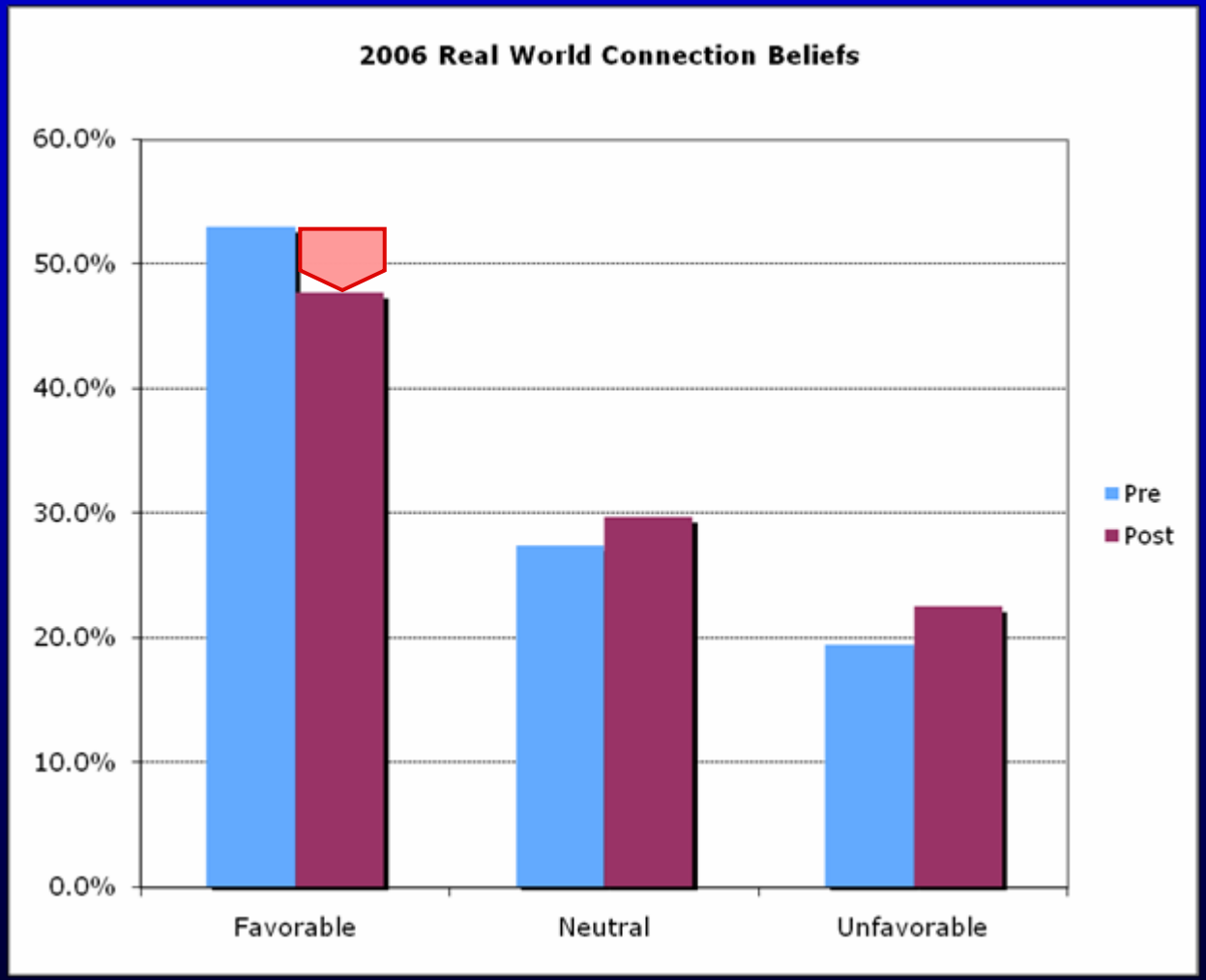
expert

"favorable"

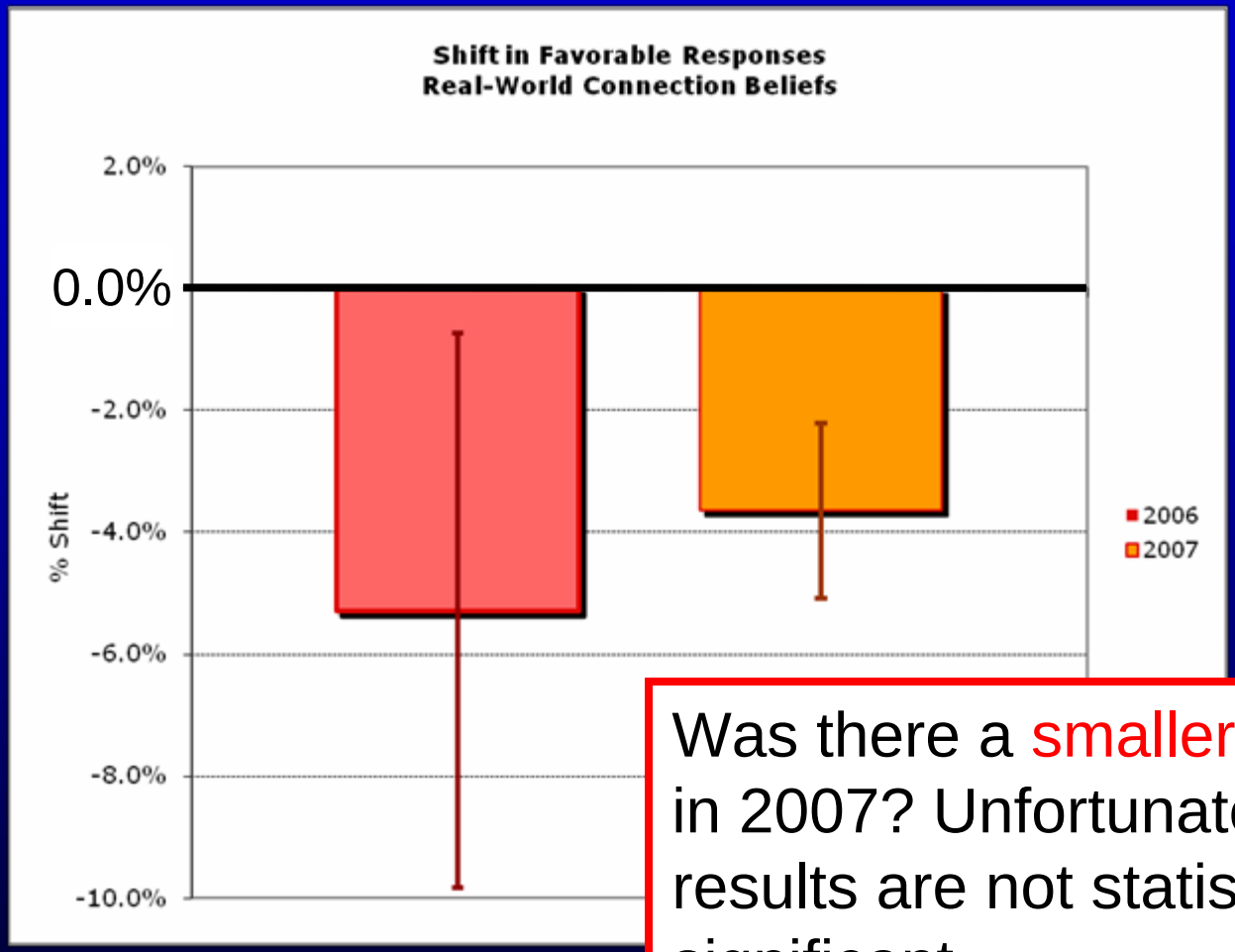
"unfavorable"

This question is one of a group of questions that gauge the students' beliefs about real world connections to physics.

2006 CLASS Results



CLASS Results



Was there a smaller decline in 2007? Unfortunately, the results are not statistically significant.

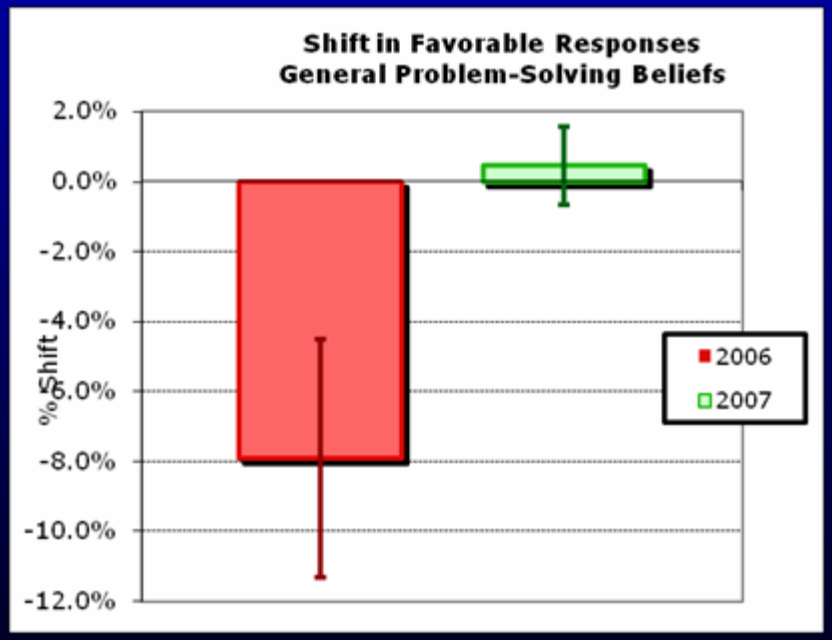
CLASS Results

CLASS also gauges the students' confidence in their problem solving skills:

Question 34: I can usually figure out a way to solve physics problems.

strongly disagree	disagree	neutral	agree	strongly agree

"favorable"



The downward trend in students' attitudes was not only reversed, there was a small increase in the students' confidence in problem solving.

Research Assessments:

Problem-Solving Skills Assessment (PSSA)

The goal of the PSSA is to isolate and measure different elements of students problem-solving skills (proportional reasoning, algebraic skills, applies real-world knowledge, checks own answers, etc.)

The survey is currently undergoing revision and validation. The next version will be administered Fall, 2008.

Example: *This question just looks to see whether students will estimate necessary information using their own experience.*

Your friend Roger stumbles and falls off the roof of a two storey house. Can you figure out how fast he is going when he hits the ground?

If you can, please do. If not, explain why not.

Changes for Fall, 2008

- Continue development of lecture material so that it introduces new physics in terms of real-world phenomena before mathematical abstraction.
- Refine lab instructions to emphasize application of results to physics in the real world. Introduce “paper-less” labs.
- Improve context-rich tutorial problems to further encourage productive group interactions.
- Improve final projects to encourage more original research.

Transformation of 107/109 Lab

Doug Bonn, James Day

Freshman Honours Physics lab serve Science One students as well as those who choose to take an enriched, first-year physics program.

Term I	**Lec**	**Lab**	**Term II**	**Lec**	**Lab**
PHYS 107 (Physics I)	●	○	PHYS 108 (Physics II)	●	
			PHYS 109 (Intro to Experimental Physics)		○

Broad goal is to use this course as a crucible for defining what we are trying to achieve in physics laboratories and how best to meet those goals.

Features of 107/109 Lab

The lab tackles phenomena the students have not seen in lectures or tutorials. It is not aimed primarily at enhancing material already covered.

The experiments are technically simple, with lots of time to explore and "mess about," but very little formal instruction on how to do things.

The aim is to learn what can't be learned in the classroom: How does a scientist connect theories and models to empirical data?

- connection between mathematics and data
- data analysis techniques
- critical thinking
- the roles played by uncertainty and systematic error

107/109 Lab Progress

Two terms (Fall 2007, Spring 2008) spent on developing learning goals, plus observing and interviewing the students, have resulted in a preliminary diagnostic tool:

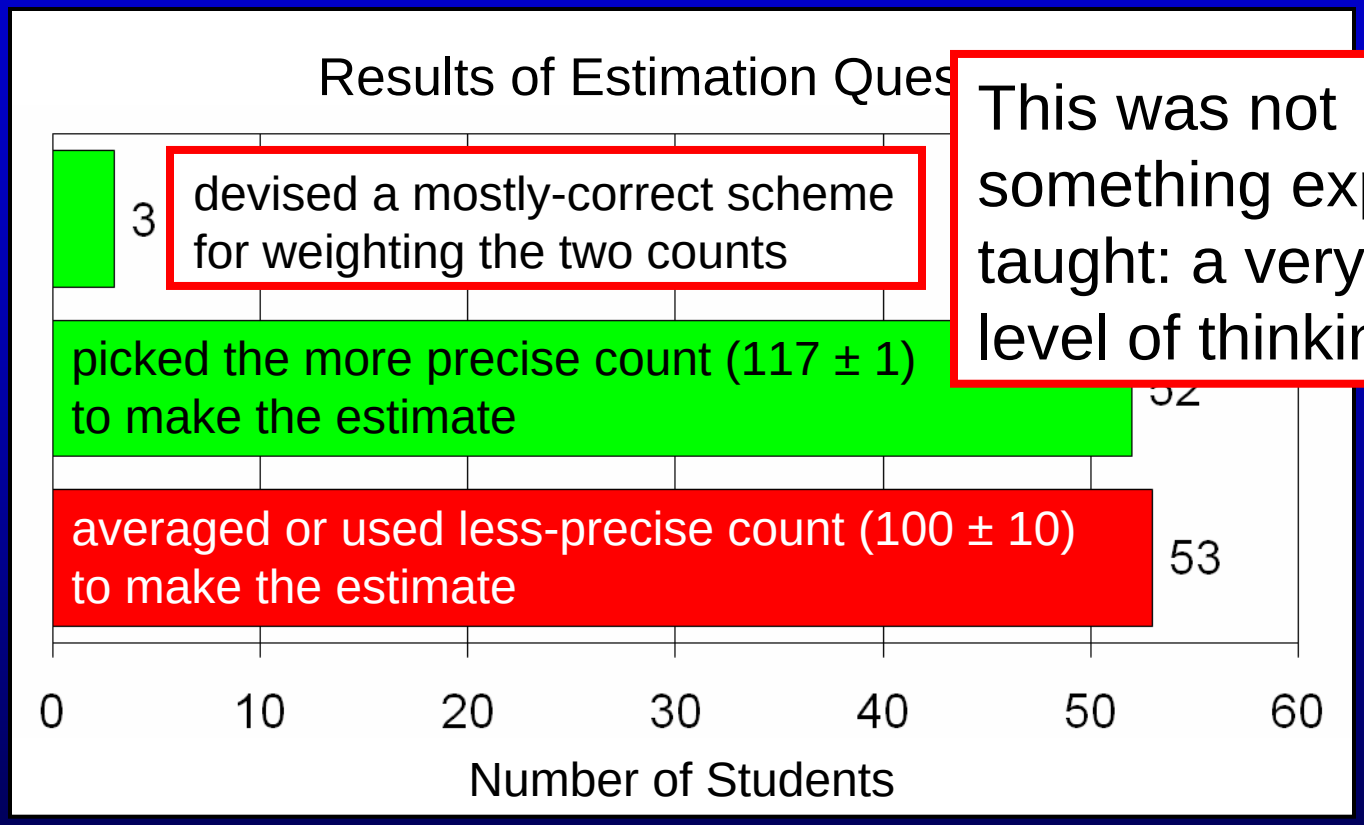
- 7 short, paper-and-pencil questions
- 1 question using lab equipment

Example: Student A measures the radioactive particles emitted by a source and reports the decay rate to be **100 ± 10** counts per second.

Student B follows the same basic procedure with the same source but counts longer and arrives at a value of **117 ± 1** counts per second.

Give an estimate of how long it would take to count 1000 particles.

Results



This was not something explicitly taught: a very high level of thinking

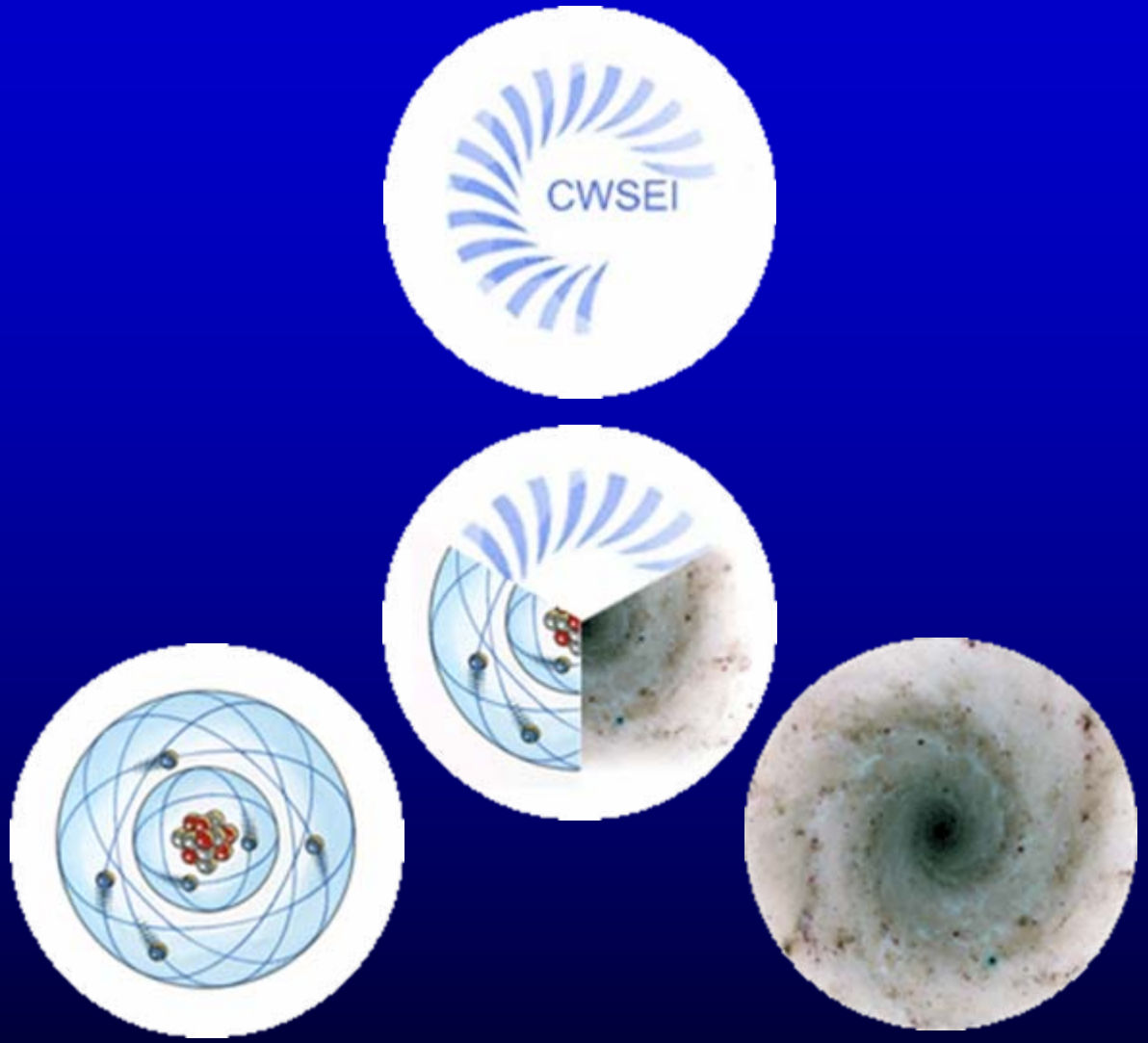
Diagnostic (failure mode): The students have been working with uncertainty all year but are unable to assess the relative importance of data with differing uncertainties.

Changes for Fall, 2008

An attempt to step forward on this next year will involve laboratory exercises in which the students themselves will try to create the mathematical tools needed to make statistical inferences about data (cf Schwartz et al., Stanford School of Education).

Second version of diagnostic tool will be used for pre- and post-testing next year.

Do you have comments and suggestions about the role of labs in the science curriculum? Attend the Discussion Session on Instructional Labs at 2:00 p.m.


CWSEI

Discussion

Course Archive

The goal is to create a long-term, easily-accessible archive of all information pertaining to PHAS courses.

- It encourages instructors to develop the course structure (learning goals, student assessment, etc.)
- It improves efficiency for course delivery, especially for instructors new to [the course | teaching], by providing easy access to teaching resources.
- It provides the Department with a form of quality control.
- Interaction with students is at the course level, not the individual level (no marks, discussion groups, etc.)

Course Archive Users

The users of the archive have different access to certain information and actions:

full access	read, write most	read only*
program coordinators	current instructors	current students
physics and astronomy education team	TA's	prospective students
sysadmin	new instructors	

* thru public interface

Front Page Information — ASTR_311 Sec: 201

Save

Front Page | Overview | Learning Goals | Audience | Outline | Schedule | Marking Scheme
Resources | Assignments | Lecture Notes | Personnel | Exams | Lab | Tutorials
Instructor Review | PublicView | StudentView | Select Course

Most of the information below is captured from the SISC or from the UBC calendar. Changes made here will be reflected only on the local pages.

Course Title	Exploring the Universe II: Stars and Galaxies
Calendar Description	A survey of recent discoveries in modern astronomy without the use of advanced mathematics. Stars, pulsars, black holes, galaxies, quasars and the origin and evolution of the Universe. Not open to first year students and not for credit in the Faculties of Science and Applied Science.
Credits	3
Prerequisites	
Corequisites	
Head Instructor	
Head Instructor email	
Course URL	
Front Page Comment	this be comment

Save

Course End Instructor Review — ASTR_311 Sec: 201

Save

Front Page | Overview | Learning Goals | Audience | Outline | Schedule | Marking Scheme
Resources | Assignments | Lecture Notes | Personnel | Exams | Lab | Tutorials
Instructor Review | PublicView | StudentView | Select Course

Here one can enter/revise "end of course" summary information course for **ASTR_311 - 201**. This information is for internal dept use only. It will not be made publicly available.

How do you rate the preparedness of the students to take this course?
Were there difficulties with the range of backgrounds & abilities of the students?
Was this apparent in the final grade distribution?

Were your students weak in, or unfamiliar with, some significant topics that they should have learned in lower-level courses?

List the basic concepts with which the students had the most trouble

What changes in learning goals or other aspects of the course would you recommend for next year?

Say which of your teaching strategies worked well, which didn't, and why?

Briefly describe what the TAs' responsiblities were.
What changes in responsiblities, in any, would you suggest?

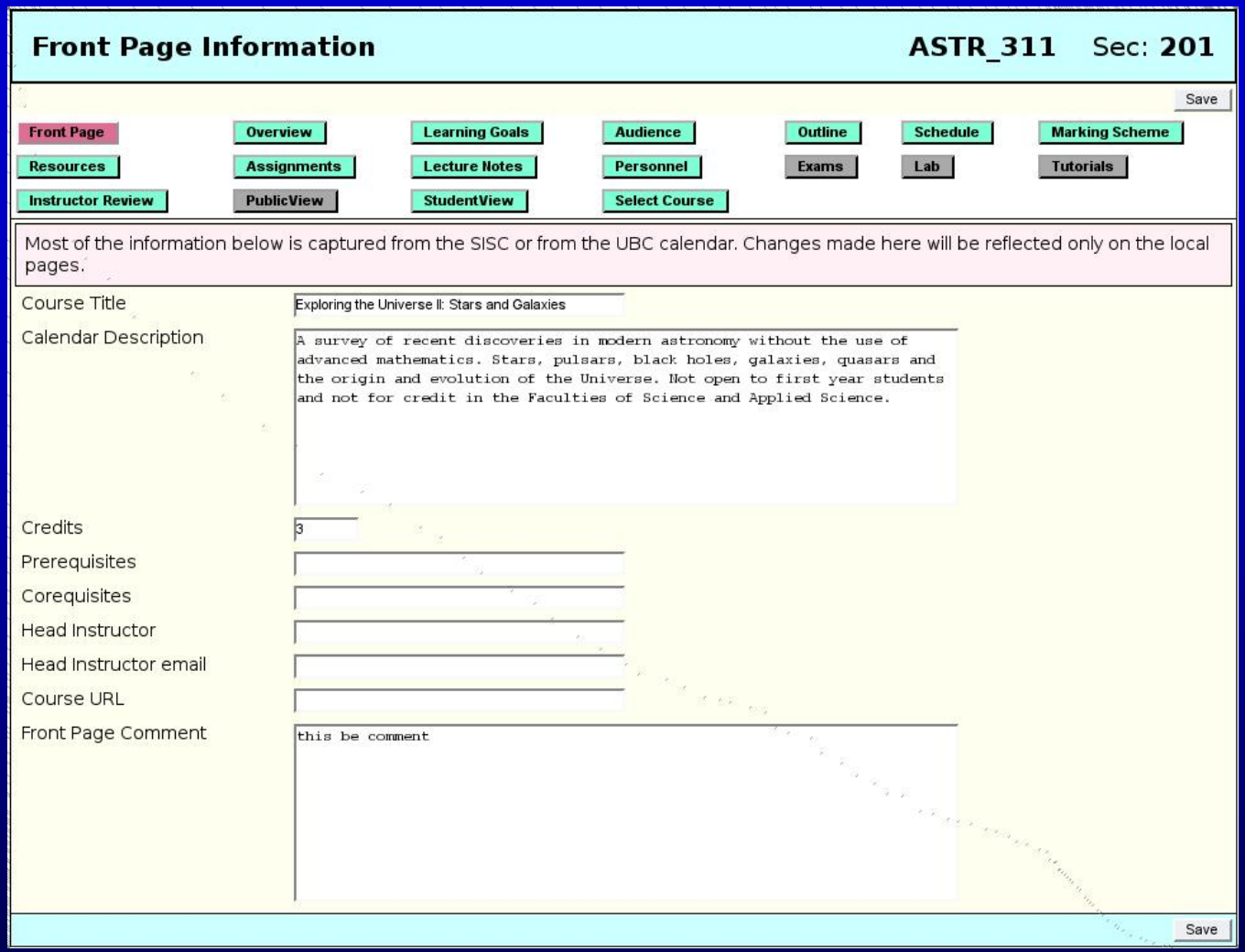
How many hours per week should a student spend on this course?
(e.g. Reading ? Assignments? Exam Prep?)

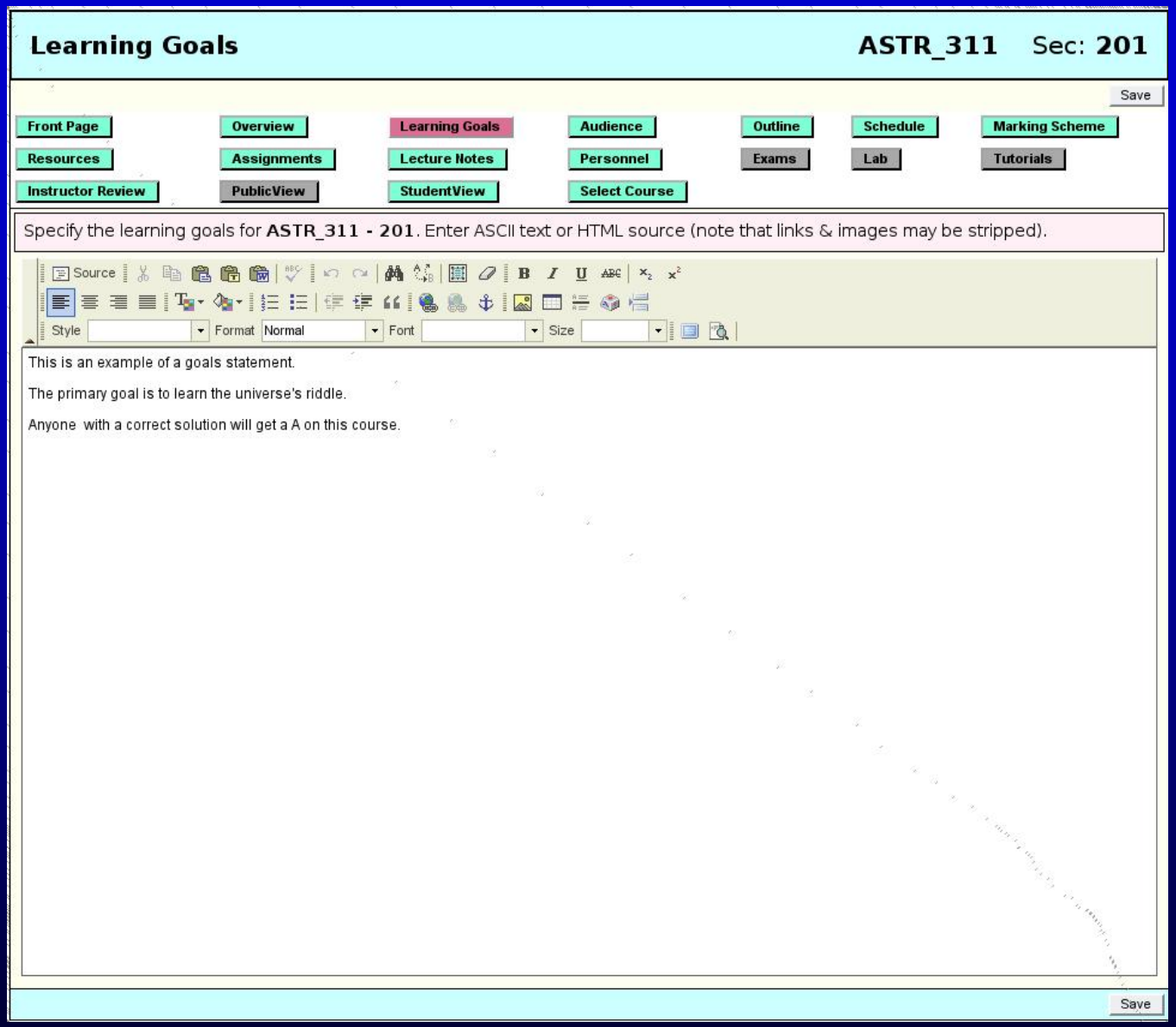
Save

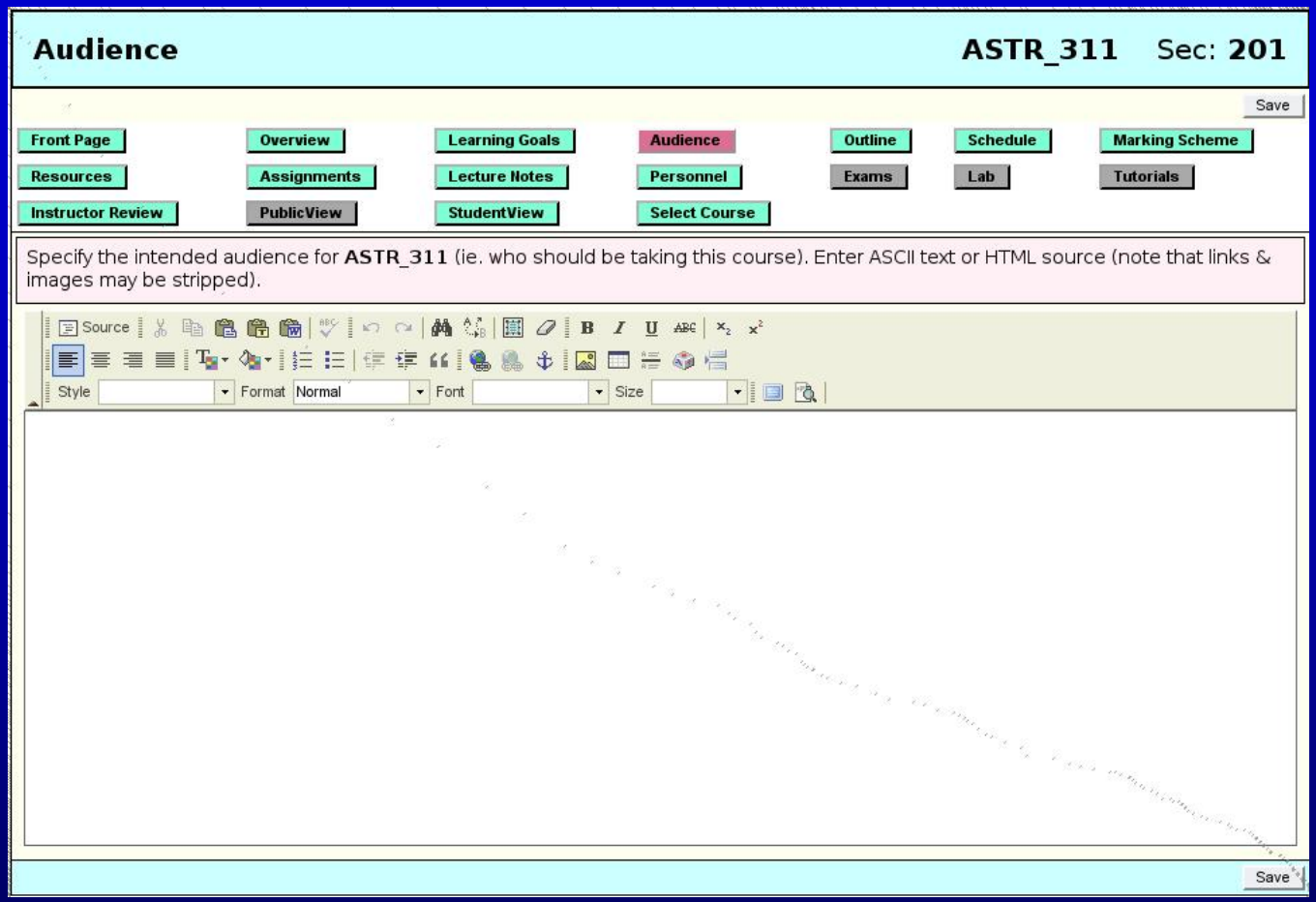
Course Goals for PHYS 100

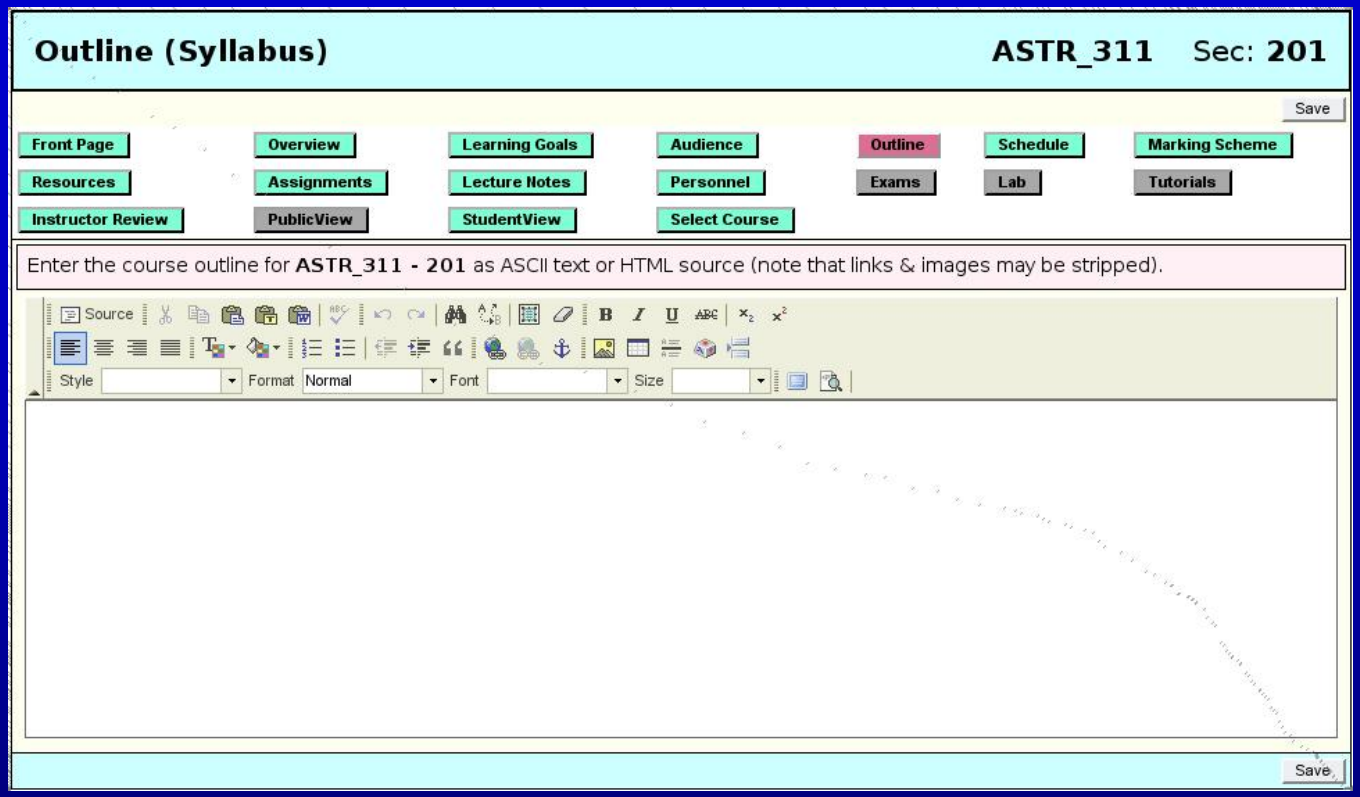
Students should be able to:

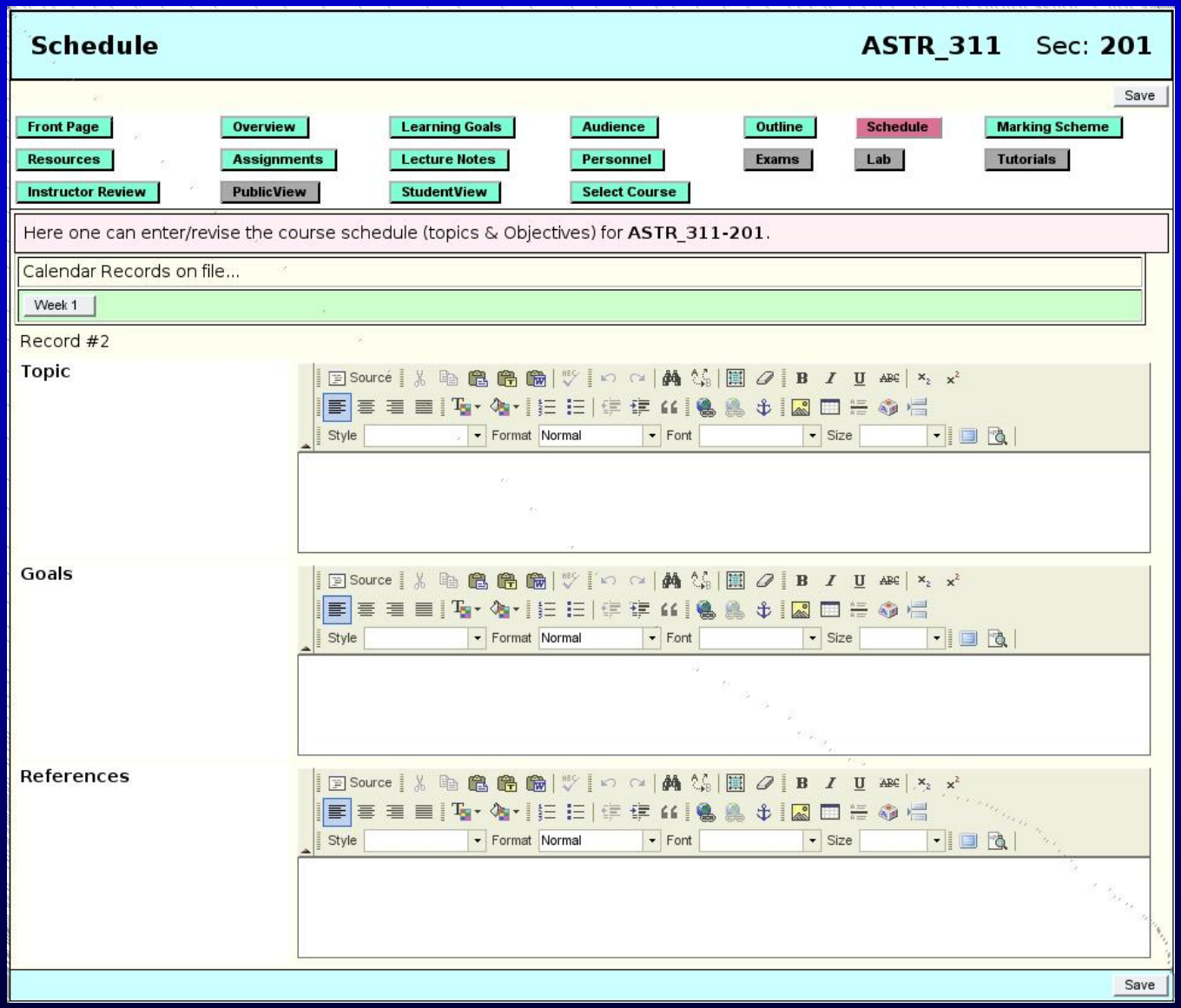
- Apply conservation of energy and thermal physics principles to real-world thermal systems, such as home heating and climate change.
- Apply knowledge of work and Newton's laws to calculate basic dynamics and energy consumption of common transportation systems.
- Qualitatively explain how electricity is generated in various types of power plants and the “life cycle” of electricity from production through transmission to consumption, and calculate power consumption for various common circuits.
- Use algebra to solve simple equations.
- Appreciate that while physics often gives approximate answers, it is very relevant to the real world and is a useful tool for solving problems at the global as well as the personal level.
- Develop the inclination and ability to apply problem solving techniques to simplify “real world” problems in terms of simple physics concepts and to compute or estimate solutions.
- Recognize that scientific conclusions - whether from an outside source or from your own calculations - may be incorrect, and develop the ability to check these conclusions with simple calculations, 3rd party information, and/or common sense.

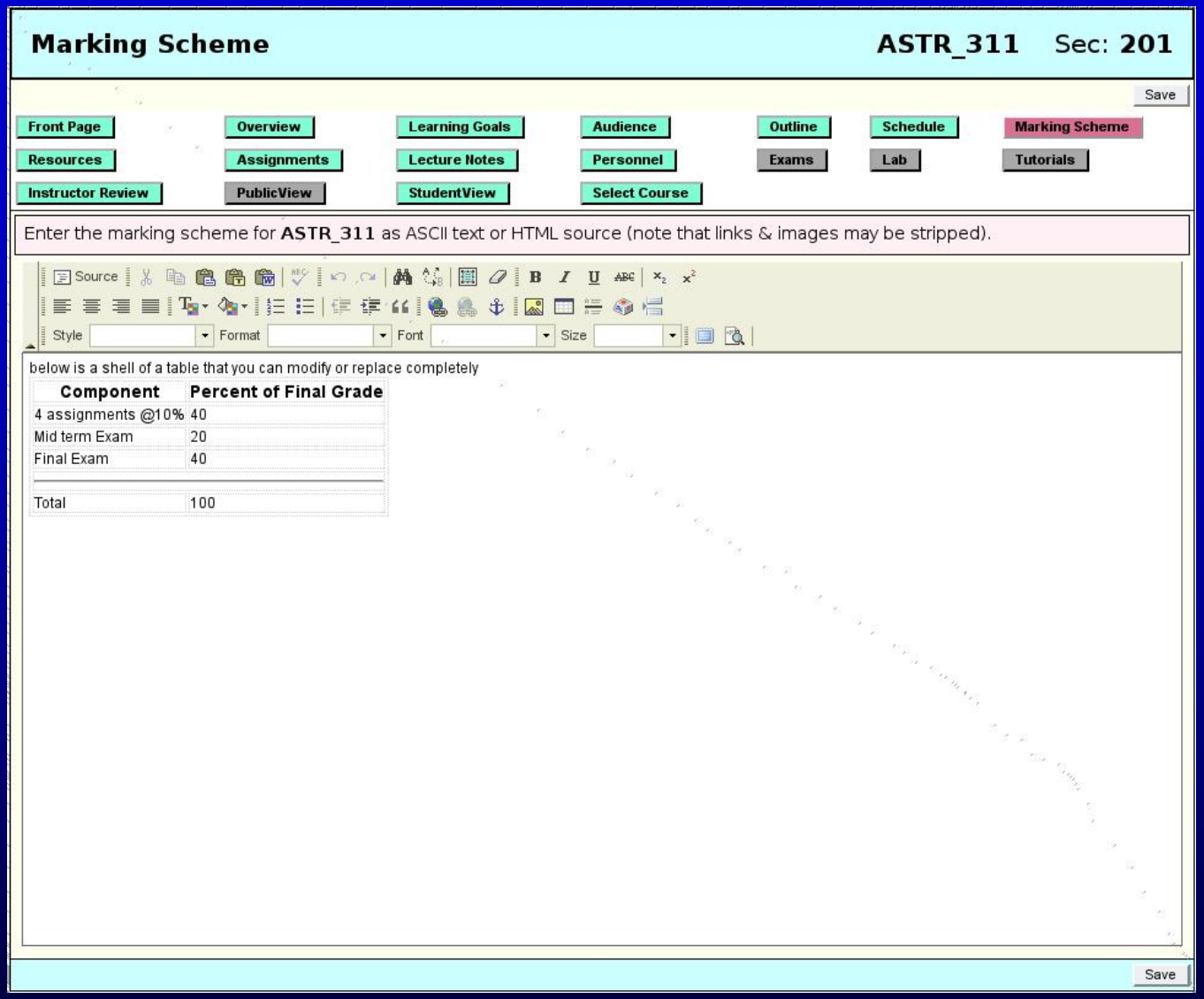

Front Page Information
ASTR_311 Sec: 201
Save
Front Page
Overview
Learning Goals
Audience
Outline
Schedule
Marking Scheme
Resources
Assignments
Lecture Notes
Personnel
Exams
Lab
Tutorials
Instructor Review
PublicView
StudentView
Select Course
Most of the information below is captured from the SISC or from the UBC calendar. Changes made here will be reflected only on the local pages.
Course Title
Exploring the Universe II: Stars and Galaxies
Calendar Description
A survey of recent discoveries in modern astronomy without the use of advanced mathematics. Stars, pulsars, black holes, galaxies, quasars and the origin and evolution of the Universe. Not open to first year students and not for credit in the Faculties of Science and Applied Science.
Credits
3
Prerequisites
Corequisites
Head Instructor
Head Instructor email
Course URL
Front Page Comment
this be comment
Save

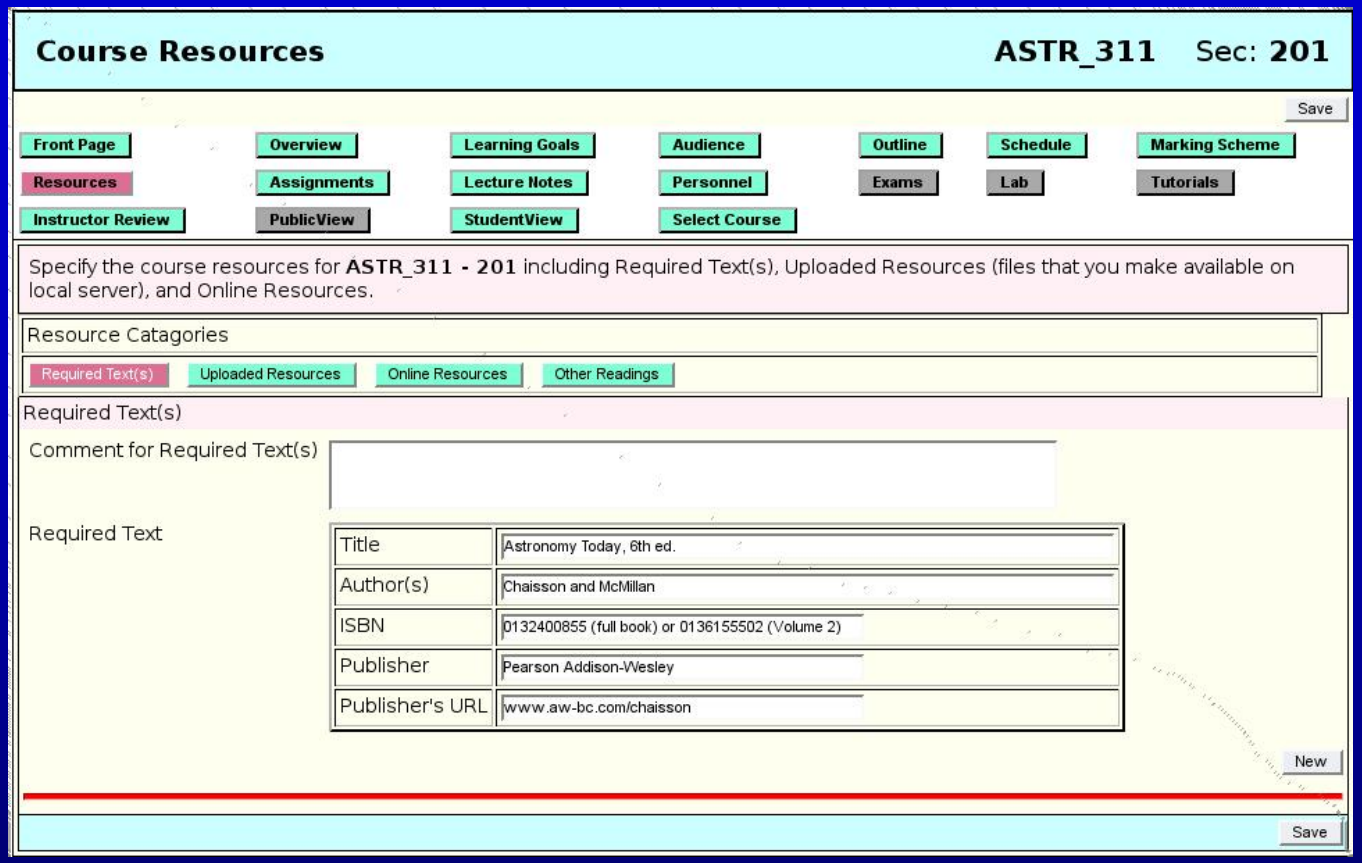

Learning Goals
ASTR_311 Sec: 201
Save
Front Page
Overview
Learning Goals
Audience
Outline
Schedule
Marking Scheme
Resources
Assignments
Lecture Notes
Personnel
Exams
Lab
Tutorials
Instructor Review
PublicView
StudentView
Select Course
Specify the learning goals for ASTR_311 - 201. Enter ASCII text or HTML source (note that links & images may be stripped).
Source
Style
Format
Normal
Font
Size
This is an example of a goals statement.
The primary goal is to learn the universe's riddle.
Anyone with a correct solution will get a A on this course.
Save

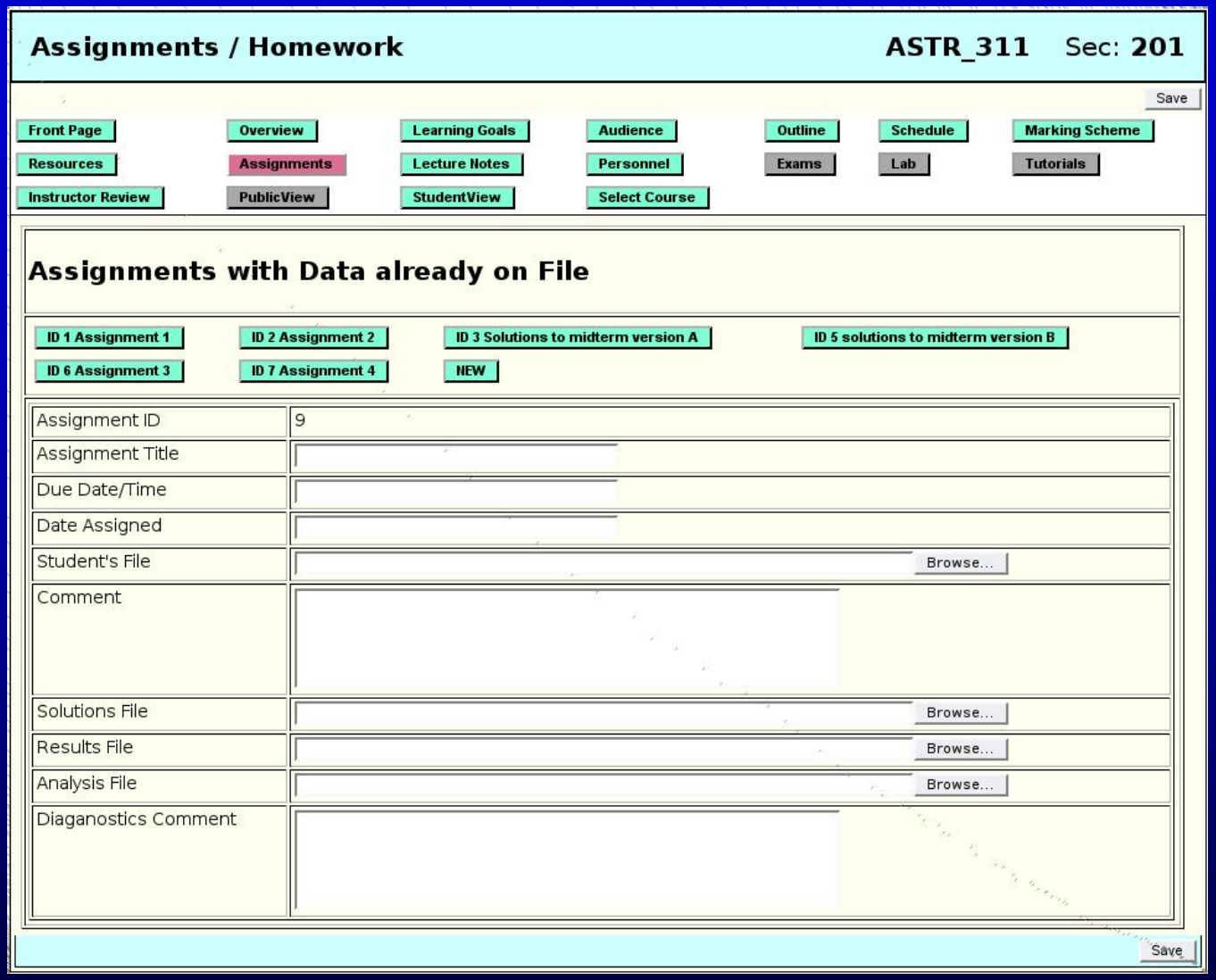

Audience
ASTR_311 Sec: 201
Save
Front Page
Overview
Learning Goals
Audience
Outline
Schedule
Marking Scheme
Resources
Assignments
Lecture Notes
Personnel
Exams
Lab
Tutorials
Instructor Review
PublicView
StudentView
Select Course
Specify the intended audience for ASTR_311 (ie. who should be taking this course). Enter ASCII text or HTML source (note that links & images may be stripped).
Source
Style
Format
Normal
Font
Size
Save

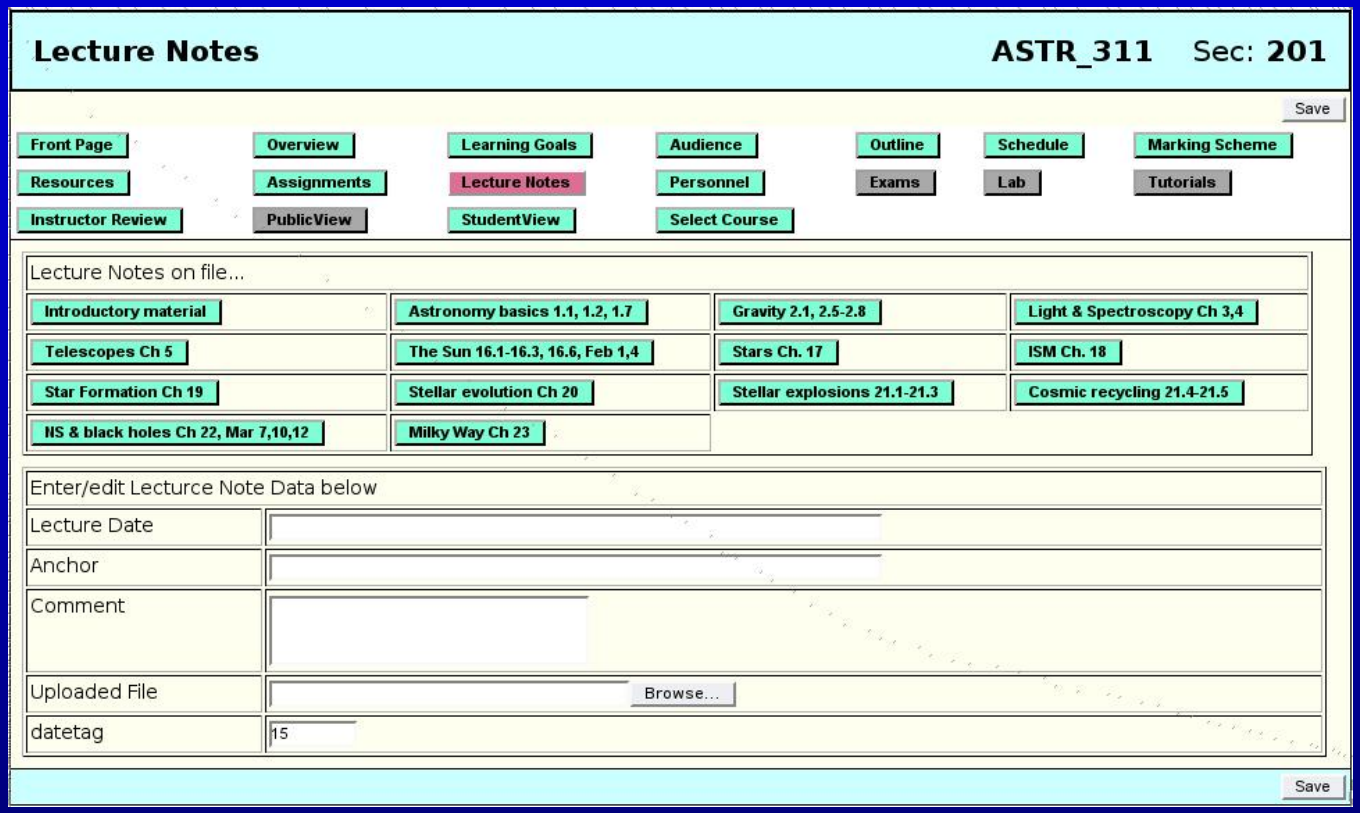

Outline (Syllabus)
ASTR_311 Sec: 201
Save
Front Page
Overview
Learning Goals
Audience
Outline
Schedule
Marking Scheme
Resources
Assignments
Lecture Notes
Personnel
Exams
Lab
Tutorials
Instructor Review
PublicView
StudentView
Select Course
Enter the course outline for ASTR_311 - 201 as ASCII text or HTML source (note that links & images may be stripped).
Source
Style
Format
Normal
Font
Size
Save

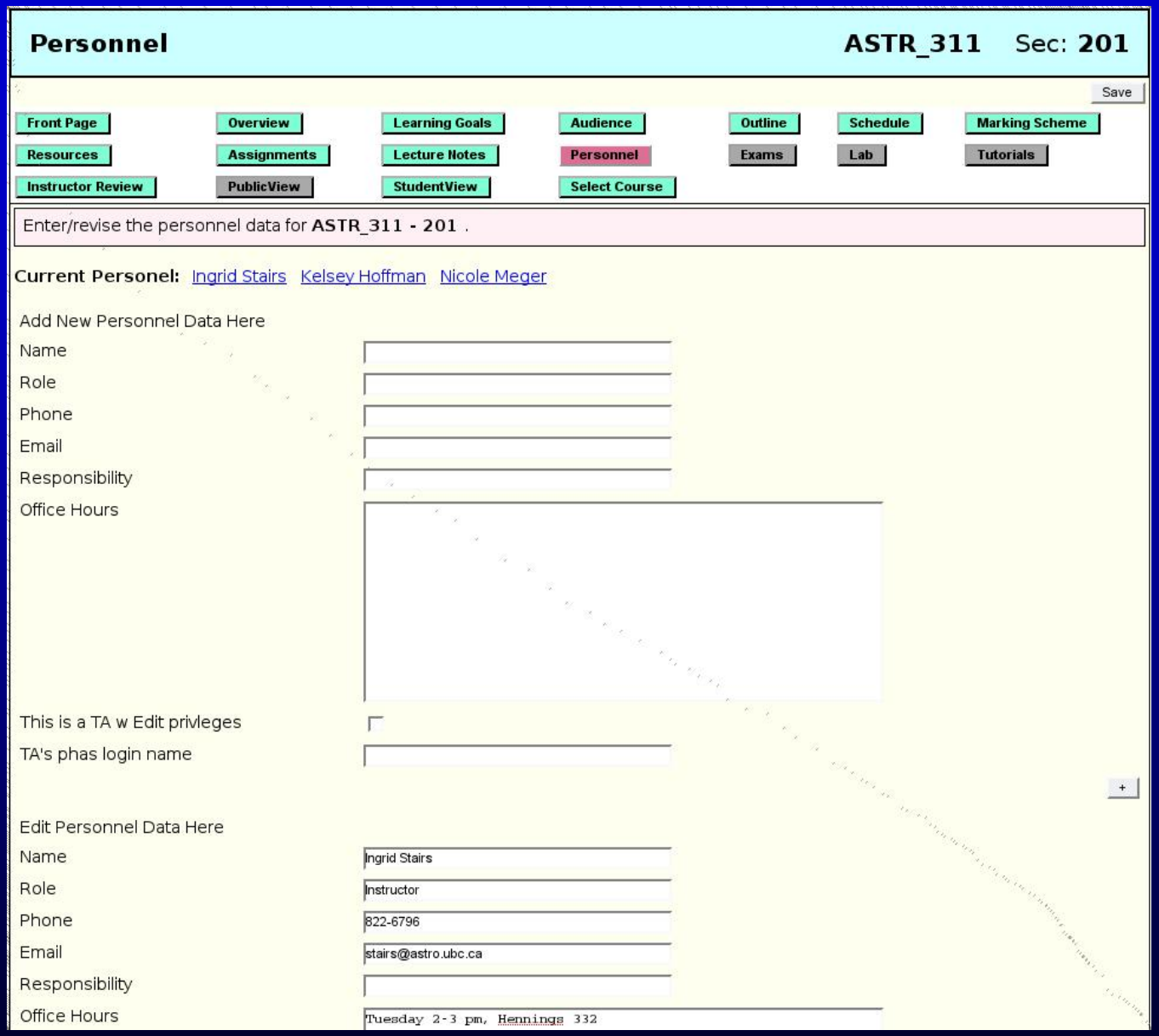

Schedule
ASTR_311 Sec: 201
Save
Front Page
Overview
Learning Goals
Audience
Outline
Schedule
Marking Scheme
Resources
Assignments
Lecture Notes
Personnel
Exams
Lab
Tutorials
Instructor Review
PublicView
StudentView
Select Course
Here one can enter/revise the course schedule (topics & Objectives) for ASTR_311-201.
Calendar Records on file...
Week 1
Record #2
Topic
Source
Style
Format
Normal
Font
Size
Goals
References
Save

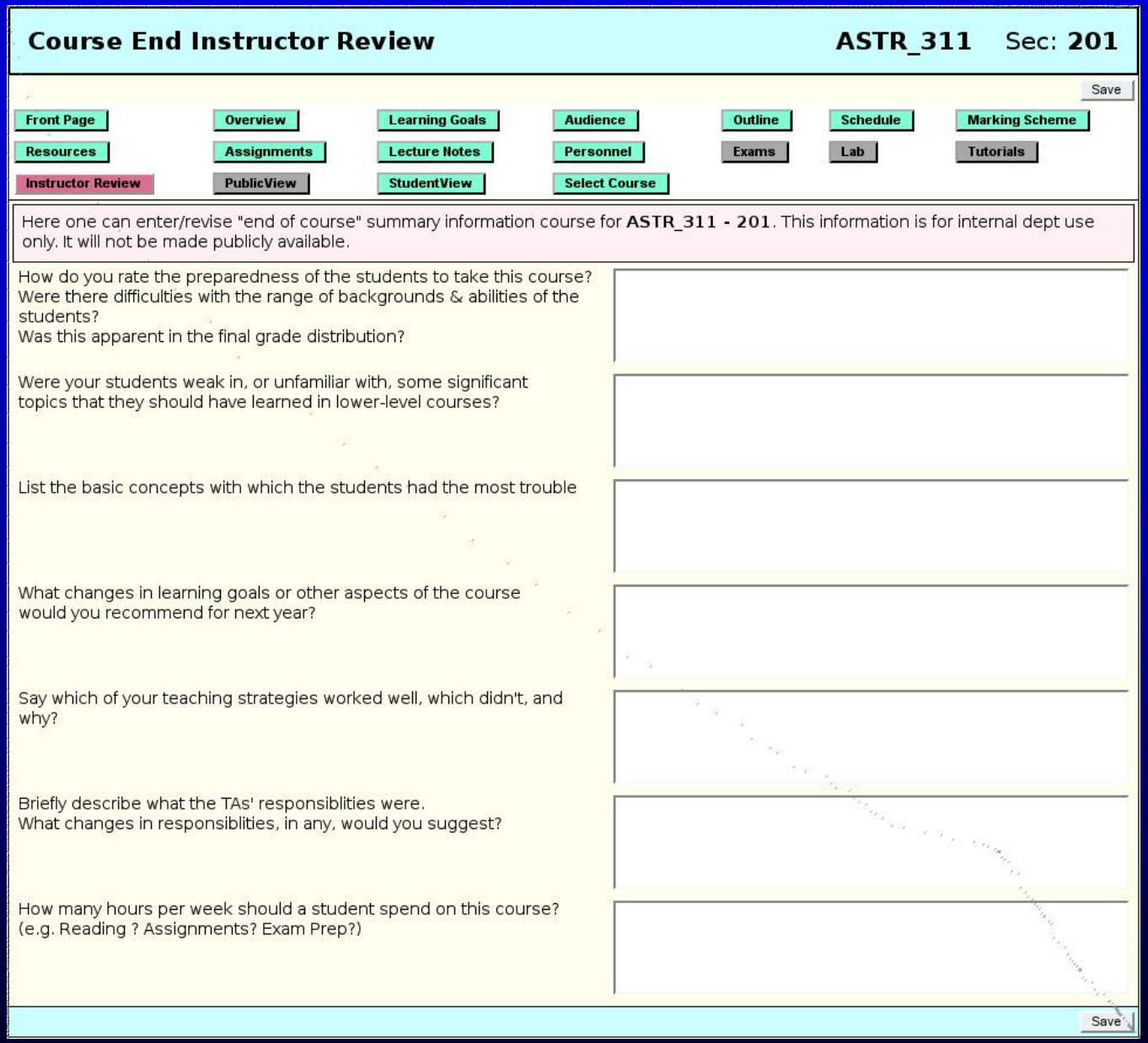

Marking Scheme
ASTR_311 Sec: 201
Save
Front Page
Overview
Learning Goals
Audience
Outline
Schedule
Marking Scheme
Resources
Assignments
Lecture Notes
Personnel
Exams
Lab
Tutorials
Instructor Review
PublicView
StudentView
Select Course
Enter the marking scheme for ASTR_311 as ASCII text or HTML source (note that links & images may be stripped).
Source
Style
Format
Font
Size
below is a shell of a table that you can modify or replace completely
Component
Percent of Final Grade
4 assignments @10%
40
Mid term Exam
20
Final Exam
40
Total
100
Save

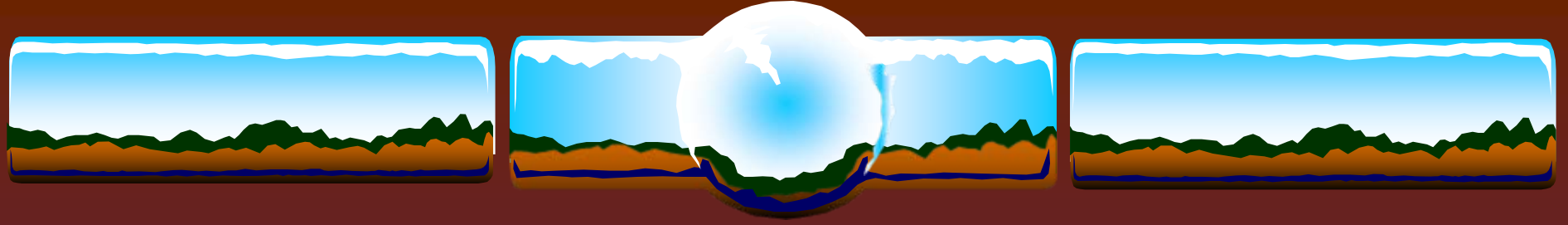

Course Resources
ASTR_311 Sec: 201
Save
Front Page
Overview
Learning Goals
Audience
Outline
Schedule
Marking Scheme
Resources
Assignments
Lecture Notes
Personnel
Exams
Lab
Tutorials
Instructor Review
PublicView
StudentView
Select Course
Specify the course resources for ASTR_311 - 201 including Required Text(s), Uploaded Resources (files that you make available on local server), and Online Resources.
Resource Catagories
Required Text(s)
Uploaded Resources
Online Resources
Other Readings
Required Text(s)
Comment for Required Text(s)
Required Text
Title
Astronomy Today, 6th ed.
Author(s)
Chaisson and McMillan
ISBN
0132400855 (full book) or 0136155502 (Volume 2)
Publisher
Pearson Addison-Wesley
Publisher's URL
www.aw-bc.com/chaisson
New
Save


Assignments / Homework
ASTR_311 Sec: 201
Save
Front Page
Overview
Learning Goals
Audience
Outline
Schedule
Marking Scheme
Resources
Assignments
Lecture Notes
Personnel
Exams
Lab
Tutorials
Instructor Review
PublicView
StudentView
Select Course
Assignments with Data already on File
ID 1 Assignment 1
ID 2 Assignment 2
ID 3 Solutions to midterm version A
ID 5 solutions to midterm version B
ID 6 Assignment 3
ID 7 Assignment 4
NEW
Assignment ID
9
Assignment Title
Due Date/Time
Date Assigned
Student's File
Browse...
Comment
Solutions File
Browse...
Results File
Browse...
Analysis File
Browse...
Diaganostics Comment
Save


Lecture Notes
ASTR_311 Sec: 201
Save
Front Page
Overview
Learning Goals
Audience
Outline
Schedule
Marking Scheme
Resources
Assignments
Lecture Notes
Personnel
Exams
Lab
Tutorials
Instructor Review
PublicView
StudentView
Select Course
Lecture Notes on file...
Introductory material
Astronomy basics 1.1, 1.2, 1.7
Gravity 2.1, 2.5-2.8
Light & Spectroscopy Ch 3,4
Telescopes Ch 5
The Sun 16.1-16.3, 16.6, Feb 1,4
Stars Ch. 17
ISM Ch. 18
Star Formation Ch 19
Stellar evolution Ch 20
Stellar explosions 21.1-21.3
Cosmic recycling 21.4-21.5
NS & black holes Ch 22, Mar 7,10,12
Milky Way Ch 23
Enter/edit Lecturce Note Data below
Lecture Date
Anchor
Comment
Uploaded File
Browse...
datetag
15
Save


Personnel
ASTR_311 Sec: 201
Save
Front Page
Overview
Learning Goals
Audience
Outline
Schedule
Marking Scheme
Resources
Assignments
Lecture Notes
Personnel
Exams
Lab
Tutorials
Instructor Review
PublicView
StudentView
Select Course
Enter/revise the personnel data for ASTR_311 - 201 .
Current Personel: Ingrid Stairs Kelsey Hoffman Nicole Meger
Add New Personnel Data Here
Name
Role
Phone
Email
Responsibility
Office Hours
This is a TA w Edit privleges
TA's phas login name
+
Edit Personnel Data Here
Name
Ingrid Stairs
Role
Instructor
Phone
822-6796
Email
stairs@astro.ubc.ca
Responsibility
Office Hours
Tuesday 2-3 pm, Hennings 332


Course End Instructor Review
ASTR_311 Sec: 201
Save
Front Page
Overview
Learning Goals
Audience
Outline
Schedule
Marking Scheme
Resources
Assignments
Lecture Notes
Personnel
Exams
Lab
Tutorials
Instructor Review
PublicView
StudentView
Select Course
Here one can enter/revise "end of course" summary information course for ASTR_311 - 201. This information is for internal dept use only. It will not be made publicly available.
How do you rate the preparedness of the students to take this course? Were there difficulties with the range of backgrounds & abilities of the students?
Was this apparent in the final grade distribution?
Were your students weak in, or unfamiliar with, some significant topics that they should have learned in lower-level courses?
List the basic concepts with which the students had the most trouble
What changes in learning goals or other aspects of the course would you recommend for next year?
Say which of your teaching strategies worked well, which didn't, and why?
Briefly describe what the TAs' responsiblities were.
What changes in responsiblities, in any, would you suggest?
How many hours per week should a student spend on this course? (e.g. Reading ? Assignments? Exam Prep?)
Save



CWSEI and Statistics
STAT 200: Then & Now

Dr. Bruce Dunham

Department of Statistics

UBC

Statistics?

` … is always read for profit, never for pleasure.’

(critic of Isaac Todhunter, 19th century mathematician)

The way we were…

- Grades were good!
- Students were happy!
- And yet …

So we …

- Develop learning outcomes
- Introduce PRS
- Devise attitudinal survey
- Transform labs
- Introduce workshops
- Revisit assessment goals

How successful?

- Student interviews … somewhat encouraging
- Student interaction … much improved
- Assessment … inconclusive
- Follow on courses … evidence pending

The future?

- So far so good, but we can do better.
- Time for consultation?
- … and maybe a re-think?

Or perhaps …

`No. I have been teaching all my life. I do not want to have my ideas upset.'

(Isaac Todhunter, 1820 – 1884)