

121709

FINAL REPORT for BIOS 101 Janovy 1:30 MWF Fall, 2009 Henzlik Hall Auditorium

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<http://bsweb.unl.edu/labs/janovy>

Abstract:

This report is intended to provide information potentially useful to anyone who is assigned a large lecture section of introductory biology, i.e., any of the 100-level courses, and especially those satisfying the current Achievement Centered Education (ACE) general education requirements. The report contains course statistics, pedagogical considerations, a table of writing assignments, discussion of teaching challenges (e.g. evolution content), uses of Course Management Software, assessment of logistical demands, assessment of outcomes achievement, comments about exportable practices, and recommendations. UNL users wishing to be added to the Blackboard site for this course, thus obtaining access to all content, including all lecture PowerPoints and audio files (in *.wma and *.m4a format), student essays on evolution, writing feedback, etc., should let me know and I'll "enroll" you. Student evaluation statistics, when available, will be provided.

Statistics:

A statistical summary of this class is as follows:

	Number	Exam #1	Exam #2	Exam #3	Writing scores	Attendance data
Starting enrollment	241					
Ending enrollment	224					
Number with >140 writing points (140 is max)	107					
Number with >120 writing points	155					
Number with >85% Attendance (class average)	166					171 (76% of the class)
Number with portfolio bonus points (+50)	153					
Class average		69.2%	65.3%	61.7%	123/140	90%
Number of students recognized outside of class (by Thanksgiving)	88					
Number of posts on Blackboard discussion board (including JJ's responses to questions)	762					
90-100% Final average	94					
80-89% Final average	64					
70-79% Final average	30					
60-69% Final average	29					
50-59% Final average	10					

<50% Final average	4					
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Pedagogical considerations:

Pedagogical principles applied to my large, introductory lecture sections (BIOS 101, BIOS 103, BIOS 112, and BIOS 204) for the past 40+ years are as follows:

- (1) Use a variety of instructional modes, including lecture, quiz, writing, large exam, out-of-class exercises, film, etc. The Friday writing and follow-up component of the course is my answer to the failures of multiple-choice exams as instructional devices for the current generation of students.
- (2) Use all available campus resources, as well as resources readily available locally to all students, including Morrill Hall, Sheldon Museum, campus flora and fauna, Museum of Nebraska History, Center for Great Plains Studies, etc.
- (3) Do not accept the claim that large classes (200+) must be handled in any way that is substantially different from the way one would handle a small seminar.
- (4) Learn as many student names as possible, and use student information sheets to help learn names.
- (5) Design class activities to alter student behavior; reward appropriate academic behavior with points, and reward superior performance with a small number of extra points.
- (6) Find some way to give every student an individual, and unique, item to use for extemporaneous or formal writing, discussion, and other educational activities (see **Supplemental Text** section below).
- (7) Set empowerment and acquisition of transferable skills as course goals and design instructional activities accordingly.
- (8) Consider the syllabus a legal document with respect to grading [only], in essence a contract relative to expectations and rewards, and write into the syllabus any options you would like to have for teaching the class and for expectations of all students.
- (9) Don't let assignment to a large lecture section destroy the time needed for your research and other scholarly activities; budget time for teaching-related activities but keep research time sacred.
- (10) Develop and practice effective classroom management strategies that encourage, and reward, academically responsible behavior; i.e., take control of your classroom regardless of the number of people in it.

Supplemental text (I-09-10):

The supplemental text for fall semester, 2009, was a scientific paper from the primary literature. A PowerPoint show was posted on Blackboard to help students discover what a bound journal was and where to find one. The supplemental text, used in most of the Friday writings, was as follows:

- (1) Go to Love Library, and go inside the building, and find a hard copy, bound, biology journal that goes back to the year you were born.
- (2) Pick some article, **PUBLISHED IN THE YEAR YOU WERE BORN**, about whole organisms (plants, animals, fungi, or protists), in which scientific names are used.
- (3) Chose a species (one species) by scientific name. This species is your writing companion for the semester.
- (4) Photocopy that scientific paper from the primary literature.
- (5) Keep that paper with you at all times.
- (6) Read it over and over.
- (7) Put your scientific name into the Blackboard discussion forum set up for that purpose. (No scientific name choice duplicates allowed; first choice wins.)

When one of the Friday writing prompts (below) refers to “your species,” that means the species chosen by the student by virtue of picking the primary literature paper.

Friday writing:

Friday writings were intended to accomplish the following goals: (1) greatly increase student awareness of biological materials around them, (2) help students understand the various ways biological information is conveyed and used outside of class, (3) develop communication skills and breadth, (4) provide me with insight into the background of our students, (4) provide some graded activity other than multiple-choice tests, (5) put some of the responsibility for understanding evolution on student shoulders in a way more effective than reading assignments and multiple-choice questions, and most important, (6) change student behavior relative to engagement with the course materials. The writing requirements as given in the syllabus were as follows:

Writing exercises: Every Friday during the semester I will give small, extemporaneous, writing assignments. You will get 1-3 points (awarded subjectively on the basis of grammar, information content, etc.) for actually doing these assignments in class, and another 4-7 points (awarded subjectively on the basis of grammar, spelling, originality and insight) if you pick them up on time, do the follow-up writing, and return them on time. Follow-up writing will consist of typing the paper (double-spaced) exactly as you wrote it in class, then evaluating your own performance with a single page of double-spaced typing that addresses matters of grammar, style, and the extent to which you were successful in doing the assignment. These writing exercise follow-ups are due the day the next one is given (the following Friday).

Portfolio Bonus Points: If, some time during the last week of the semester, you show me your complete set of work for this class, assembled according to instructions on Blackboard, and you have received at least 120 of the 140 points available through writing assignments during the semester, I will add 50 points to your total for the semester. Detailed instructions for preparing your course portfolio will be provided on Blackboard.

The weekly writing prompts were as follows:

Date	Prompt
082809	Would your chosen species be a cooperative one for you to use in designing experiments? Answer “yes” and explain why; then answer “no” and explain why. (Note: print the name of your species at the very bottom of this page.)
090409	What was happening in the world during the year you were born that would have inspired the biologists to do the research and write the paper you are using for your scientific name?
091109	What is the most challenging idea or concept found in your scientific paper and why is this

	particular idea or concept the most challenging?
091809	Write a children’s story about your species that would inspire an eight-year old child to want to become a professional biologist.
092509	Draw a detailed scientific illustration of your species, then fill the rest of the page with a detailed structural description of your species.
100209	What would you have to do in order to find fossils of your species; where would you have to go; and what kind(s) of political or security problems would you face during the search for such fossils?
100909	Write a biologically reasonable scenario of what your species will evolve into in 5 million years, 25 million years, and 50 million years (remembering that the physicists and geologists estimate that Earth will last another 10 billion years).
101609	Produce a deep, philosophical, creative, mysterious, ORIGINAL, 250-word essay on the subject “Evolution, and what it means to me and to humanity in general” to be posted on Blackboard by noon, Wednesday, October 14, 2009.
102309	Derive the general principles of life on Earth from your original observations of specimens in this museum. Use at least three different galleries and support your conclusions with evidence, without mentioning health, agriculture, the military, money, politics, sex, sports, or religion. Fill both sides of the page with small writing. Papers will not be accepted before 2:18 PM. (Morrill Hall field trip; class met in Morrill Hall.)
103009	Explain what you hope to accomplish by installing a 40 ft. tall bronze sculpture of your species in the middle of the open green space north of the city campus Union (without once mentioning health, agriculture, the military, money, politics, sex, sports, or religion).
110609	What has been your, and your fellow students’, reaction to campus vegetation during the last two weeks? Be specific; be sure to mention at least three individual specimens and your reaction to them; be sure to comment on your fellow students’ reactions also.
111309	Write your ten personal rules, using complete sentences, for “thinking like a biologist.”
112109 and 120409	Choose six different pieces of art from inside the Sheldon Museum of Art’s permanent collection galleries (second floor, the six galleries on the south), one from each of the rooms in the permanent collection galleries. Use these six pieces as your material for writing on the subject “extreme diversity in the representation of biological materials.” Be specific, and match each of your selected pieces with some kind of representation in your text. <u>Make the case, based on evidence, that the art work and text figure use the same visual techniques.</u> Be sure to cite both the name of the piece of art and the figure number and page from your text, but you get only one sentence to describe the piece of art and <u>only the figure and page number</u> , no description, from your text.

An undergraduate TA, Nicole Searcey, read through these papers after they were done in class each Friday and awarded one to three points based on (1) whether the student actually addressed the prompt, and (2) whether a full page of writing was generated. I “graded” the follow-up writing and self-assessment every week, awarding up to seven additional points as indicated in the syllabus. The writing was, of course, done on a contract basis: if the student fulfilled the assignment (actually addressed the prompt, did the self-assessment), to the extent asked, then full credit was awarded. I tried to put one or two marks or comments on each paper, with underlines, stars, and brackets indicating interesting and/or insightful sentences or paragraphs.

Portfolio requirements and contents:

In order to receive portfolio points, a student had to fulfill the above criteria, then assemble the portfolio, in a binder of some kind, with the following sections, each tabbed for easy access:

1. Title page
2. Table of contents
3. Syllabus
4. Exam copies, answer sheets, and quizzes (quizzes optional)
5. Student's self assessment of performance on exams, study habits and techniques, etc.
6. All Friday extemporaneous writings, and follow-up self-assessments
7. Student's self-assessment and review of overall performance in the writing component
8. JJ's Blackboard feedbacks on student writing
9. Student's self-assessment of overall performance in the course

NOTE: Some students also included a copy of their primary literature paper, their pop quizzes, and the five feedback documents provided to the whole class via Blackboard.

Evolution:

The last third of the semester was spent on evolution, and the genetics section, typically covered after cell biology, was incorporated into the evolution material under the general topic of "genetic diversity: its source and mechanisms for production." This sequence is different from that used in previous semesters, but it seemed appropriate given that the schedule for genetics lab exercises were adjusted somewhat and an evolution lab was added. The Friday writing prompt for 101609 was posted on Blackboard in lieu of class attendance because that was the Friday before fall break and I had some traveling to do. Students were asked whether their essays could be used to "improve biology teaching at UNL," and the essays of those who agreed are available as a pdf file for faculty perusal. I will also add any faculty member who desires to the course roster so that he/she can look at the original postings. The take-home lesson from this exercise is that our student body is *much* more intellectually conservative, and religious, than we typically assume (although we assume students are pretty religious and conservative), and few if any have ever been truly exposed to valid scientific explanations of evolution. Student after student started the essay with "I grew up in a strong Catholic [or deeply religious] family" (or words to that effect) and called evolution a "touchy subject," ending with statements such as "people are entitled to their own opinions." Some students indicated that talk about evolution was not allowed in their homes. To whatever extent "understanding evolution" is code for "scientifically literate," we have our work cut out for us.

Course Management Software (Blackboard):

I used Blackboard extensively to provide information, post grades and answers to exams, post PowerPoint shows and audio files (including podcasts of lecture), provide a forum for discussion of old exam questions, etc. Students were heavy users only when such use was absolutely required or resulted in points (even a small number of points). Personally, I found the Grade Center to be time-consuming and constraining, and until final posting of letter grades, much less convenient than simply posting *.htm versions of Excel spreadsheets. I did make a short DOS-based program for generating 6-character ID codes for each student, and those were easy to put up in the Grade Center at the beginning of the semester so they were available to each student individually; if anyone wants an *.exe version of this ID-generator let me know.

Classroom Response System and attendance:

I used the eInstruction CRS during the fall semester, 2008, and found it completely worthless as an instructional device, compared to previous versions used in the previous three years. Consequently, in 2009, I did not use "clickers," substituting instead a variety of pop quizzes for attendance and teaching. Students were required to always have at least one sheet of 8.5" x 11" paper (recycled okay) for use with

quizzes. The instructor time spent on these kinds of responses was about equal to that spent in 2008 on processing eInstruction files.

Logistical impact:

The logistical impact of teaching BIOS 101 was evaluated in several categories, and although most of this evaluation is subjective, some of it was actually measured (timed, etc.).

PowerPoint shows: Development of a completely new show consumed about 3-4 hr per class; modification of an existing show consumed about 1-2 hr per class.

Posting audio files of lecture (Blackboard and podcast): Posting the audio files consumed about 15 minutes per class period.

Posting PowerPoint shows (Blackboard): These shows were posted prior to class and usually consumed about 15-20 minutes per class, although once the upload was started, then it was possible to do something else until the upload finished.

Posting grades: The Blackboard grading center is absolutely useless and a time sink for large classes, so grades were posted as *.html files modified from Excel spreadsheets. I posted grades five times, taking about 30 minutes per time.

Grading Friday writing: This activity consumed approximately 1-2 hr/week on the part of the TA, handling the papers produced on a Friday, and about 4 hr/week of instructor time handling the follow-up and self-assessment papers. The five feedback papers took about two hours each to write.

Student conferences: One student contracted the course for honors, and she met weekly for about 15-30 minutes per meeting on her project. I didn't record student office visits, but they were relatively minimal, and I estimate they consumed no more than an hour a week.

Answering e-mails: I received an average of about five e-mails a day, every day (including weekends), from students, mostly involving grades and missing class. It took about fifteen minutes a day to answer these messages.

In summary, I estimate spending about 18 hours a week on BIOS 101, and another 12-15 hours distributed over the course of the semester.

Exportable aspects of this section of BIOS 101:

There are a number of activities and ideas used in this class that are easily exportable and require little or no investment of faculty time. Such activities can be used to alleviate the attention-span problem, as well as put pedagogical principle (1) above into practice. These exportable ideas are:

- (1) Small in-class exercises that students do either independently or with people sitting next to them. These exercises don't have to be graded to be effective, but they can, and perhaps should, be followed by a short faculty discussion.
- (2) Pop quizzes for which there is no correct answer, but instead involve some effort toward developing an answer, and can be easily graded as done/not done. If these kinds of quizzes are anticipated, then it is always a good idea to either have them printed or have students

always bring some blank 8.5" x 11" paper or 3" x 5" cards, instead of using notebook paper (uniform paper size is easier to handle than pages torn out of student notebooks).

- (3) Use of paper doll cutouts; I use chromosomes and put a pdf file of the pictures up on Blackboard so that students print them out, cut them out, and bring them to class, but there are a number of other subjects within biology that are amenable to use of cutouts, that students handle at their seats, as teaching activities, all without having to grade anything (this activity also helps with the attention-span problem).
- (4) Skillful use of document camera; I don't claim to be a particularly skillful user, but that technology is fairly powerful and I'm always surprised when faculty members don't use it, or don't use all its features, particularly the zoom in and out. Textbook publishers, for example, will always give you an extra book copy that you can cut pages from, put those pages on the document camera, and show students how to use their book, taking notes on the pages.
- (5) Student information sheets or cards, filled out and gathered on the first day of class. I use these whenever a student comes into the office, usually to help me remember a name. As a minimum, these sheets should indicate major, home town and high school, and whether the student is on scholarship.
- (6) Some kind of individual "property" for each student. For this semester, the individual "property" was a primary literature paper and scientific name from the year the student was born. In the past, I have used individual campus plants, campus plant communities, pictures cut out of catalogs, Morrill Hall specimens, scientific names, etc. The only problems for a faculty member using such individual property will be to vary it from year to year and to devise some simple, easily graded and handled, but educational, exercises to be done on an individual basis. I've found in the past that if the individual "property" is something tangible that I give them (e.g., small seashells), then it's very important to make it worth something significant for it to be returned (if you want it back). The scientific paper and name worked very well this semester.
- (7) Attendance is a problem in large classes, so anything an instructor can do to reward it, without massive expenditure of time and effort, is worth trying.

Recommendations:

Most of these recommendations exceed my authority, but they are derived from many years in the large freshman classroom and they do address the fairly serious problem of human resource development and allocation. Based on the past three years of teaching BIOS 101 using all of the above practices, I have the following recommendations:

- (1) Give any tenured faculty member who teaches a large introductory section (BIOS 101, 102, 103) a semester off during the same academic year, with the expectation that this faculty member will use that time to develop and put into practice some effective teaching strategies that will elevate the profile of Biological Sciences on campus and provide colleagues with a report on the efforts to do so.
- (2) Change our major requirements to allow credit for BIOS 101, 102, 103, 109, and 112, with any two of these courses serving as pre-requisite for upper division courses. There are simply too many students in BIOS 101 who need to be Biological Sciences majors, and that's probably true also of BIOS 109 and 112. Alternatively, allow either the sequence BIOS 102-

103, or BIOS 101 plus one of the other courses, as fulfilling the introductory requirements for the major. This recommendation comes from years of having students fill out information sheets then interviewing them, information sheets in hand, about majors, courses, plans, etc. As a result of this activity, I am completely convinced that the advising system, aside from Wendy in Biological Sciences, is either a complete failure or is actively working against the best interests of SBS. These changes also will accomplish what I strongly believe should be a 21st Century human resource management strategy, namely, the display of faculty diversity against student diversity. In other words, those ranges need to be congruent to maximize our impact on future generations.

- (3) Establish a departmental goal of infusing as much evolution content into all courses as is practical. In general, many if not most of our students come to the university with a heavy religious background, almost brainwashed, by a combination of parental and religious influences. In my view, an individual's understanding and acceptance of evolution as the central unifying theme of biological science is a direct measure of that person's scientific literacy, or ability to become scientifically literate. A single majors' course entitled "Ecology and Evolution" is not going to solve this problem. For any technology-dependent society (e.g., the USA), a solution is necessary and we should be actively attempting, as a discipline for which evolution is the central unifying theme, to bring about such a solution insofar as we are able.

Course Evaluation:

I make it a practice of giving all my classes an evaluation (in return for theirs of me!). Over the next few days, I will write that evaluation for this class and also distribute it to faculty members with a potential interest (whether they know they have such interest or not!) in the introductory program.

Happy holidays.

JJ