Gateway Coalition Project: Spring 1999

DEVELOPING COLLABORATIVE LEARNING STRATEGIES FOR LARGE CLASSES

Revised Project Plan

2 February 1999

Project overview:

This project will assist Columbia faculty who might wish to develop cooperative education techniques for large classes. It will:

- directly support experimentation in one large General Chemistry course at Columbia;
- enlist certain faculty at Ohio State to either join or support this experiment;
- produce a multimedia documentary that will both assist the experiment as it is progressing and inform those faculty contemplating this sort of curriculum development of its potential and the problems to anticipate.

The experiment in General Chemistry at Columbia will compare two halves of the course - one lecture session taught with group activities and the other lecture session taught with comparable but individual activities. The group activities will be implemented and refined as the course proceeds based on experience and on evaluative discussions with an Ohio State physicist who is an expert developer of group cooperative study techniques for large classes. These consultative discussions will be based upon video and descriptive data of class activity at Columbia. They will be mediated by video-conferencing. An instructor of a physics course at Ohio State for which cooperative activities have already been developed and are in early stages of evaluation will share in these evaluative consultations and in the assessment activities of the project. The Columbia class data and the record of the consultative video-conference sessions will be the "database" from which the multimedia documentary will be drawn. This documentary will be a WWW-site that will grow as the course experiments proceed during the semester. Its multiple "views" will each serve a particular clientele:

- principals in the experiment;
- faculty external to the experiment who wish to follow and might interact with its principals during the experiment;
- faculty and others who have a general curiosity or interest in cooperative study in large classes and wish to see what's involved in trying to develop suitable curricula.

The project director will be responsible for:

- creation of the telecomputing environment for the video-conferences;
- collection of class activity data, such as televised classroom scenes, and creation of supplementary material, such as data annotations and descriptive reports;
- installation and indexing of those data and materials into a computerized database;
- design of a WWW interface to that database to permit users to access those data via a multiplicity of views, each suitable to the role of the user.

The project director will also aid faculty in creating suitable assessment instruments by means of which they will evaluate the educational success of their cooperative learning strategy and tactics needed at each of their iterations.

Project plan and rough timeline:

The principals:

Norman Chonacky - Project director, and visiting professor at Columbia.

Nick Turro - Instructor of the experimental cooperative learning section of C1404, General Chemistry, and professor of chemistry at Columbia.

Leonard Fine - Instructor in the conventional section of C1404, and professor of chemistry at Columbia.

Alan Van Heuvelen - Expert consultant, and professor of physics at Ohio State.

Kathy Andre <kma@mps.ohio-state.edu> Research Associate & graduate student in physics education at Ohio State.

Richard Furnstahl <furnstah@mps.ohio-state.edu> Instructor in newly designed cooperative learning physics course, and professor of physics at Ohio State.

Xxxx Xxxx - Student Technology Assistant for database and WWW-site programming, and undergraduate student at Columbia.

The tasks (in rough chronological order):

- Adopt a provisional plan for experimentation in C1404 (*c.f.* C1404 pre-course planning summary)
- Exposit the plan for innovation already embedded in Physics NNN
- Construct the survey for administration early in the course(s)
- Administer the early survey instrument and obtain student permissions
- Monitor C1404 recitation sessions that have group learning activities
- Videotape select C1404 recitation session(s) convened in studio and possibly a lecture in the normal lecture hall
- Formulate rapid, initiate documentary segment for presentation to consultant
- Create agenda for and conduct first video-conference session
- Analyze results of early activities for iterative changes in project procedures
- Participate with C1404 instructors to prepare next iteration of activities
- Collect more data from recitations and full class sessions - update documentary with additional segments and distinct viewing interfaces
- Create agenda and conduct second video-conference
- Analyze results of activities, iterate project procedures, confer with C1404 instructors to iterate class activities
- Repeat experiment cycle (as above) twice more, enlarging the conference if other faculty wish to participate
- Prepare final assessment strategy and create appropriate surveys for all participants
- Administer the survey instruments
- Organize program and convene principals for wrap-up conference and analysis
- Create final report and put finish on the documentary product
- Assess external impact of the documentary

Project milestones:

29 January	closure on project agreement
3 February	"beginning" of course survey ready
8 February	group activities begin in recitation sessions
19 February	first segment of documentary ready
3 March	first consultative video-conference
25 March	second consultative video-conference
14 April	third consultative video-conference

3 May	"end" of course survey ready
4 May	fourth consultative video-conference
14 & 15 May	Summative conference (w/ITC wrkshp. also)

Project description:

This project will produce a multimedia product that faculty can use to introduce themselves to active learning of content concepts by the use of small student learning groups in large classes. The learning activities in the experimental class where the development of suitable group activities will take place will make tactical use of:

- small group discussions to solve conceptual "challenge" problems offered in the large class setting;
- small group learning activities with computer media-based learning tasks in recitation session settings;
- group-oriented approach to a standard writing project assignment - ChemWrite;
- special tutorial-based project conducted by the course instructor with a single small group of volunteer students.

Professor Nick Turro is interested in modifying his section (of one-half semester) of the General Chemistry course this spring semester. He wishes to increase the quality of involvement and the resultant understanding of the chemical concepts of his students. His chosen means are to:

- wrap the course content in the practical context of the natural environment;
- introduce cooperative learning in the form of small groups of students.

These cooperative learning activities would be of the sort outlined above. He has some assurance that his successor in the second half of this semester will continue to pursue his experimental reforms with this course section. Thus we plan to have an entire semester to experiment and an equivalent course section taught by individual-oriented methods to serve as a control.

Alan Van Heuvelen is interested in how active learning can be applied to help student understanding of science concepts. His preferred means are to:

- use multimedia interactively to improve student conceptual development and problem solving expertise;
- learn the skills needed to address more complex "Context-Rich Problems" and "Experiment Problems" that are more like problems found in the real world;
- introduce interactive methods in both parts of the course - lectures and recitations.

Alan is an experienced developer of multimedia materials that are used nationwide to permit students to use active learning to understand general physics concepts and solve complex problems better. He will act as a consultant to the Columbia group involved with General Chemistry group, to critique what they are doing and advise them how to improve.

Because Alan is at Ohio State and himself is teaching this semester, we must provide means of giving him the information about the General Chemistry class that he needs to play his consultative role. We will treat this challenge as an opportunity by availing ourselves of digital imaging technology, desktop and studio video, and the WWW to develop and present to Alan this information. At the same time we will "repackage" it, also in WWW format, to inform other faculty about the pros/cons of active learning in large class settings and advertise to inspire them to try it for themselves. In this process of using multimedia to facilitate the consultative learning process, we shall also be modeling to observing faculty how they might use information technology in general and multimedia in particular to facilitate cooperative learning in their *own* classes.

The documentary will be a WWW-site of html pages and Acrobat documents. The multimedia will be implemented in QuickTime 3 and will be viewable to anyone having such a plug-in. Versions of this Apple product are available for all major platforms. The video conferencing will be conducted using "desktop" video facilities provided in the Intel Pro-Share package. This works only with Intel-powered computers. These, and/or the necessary additional hardware and software will be provided to the principals.

In addition to the General Chemistry experiment headed by Professor Turro at Columbia, Professor Richard Furnstahl at Ohio State who will test his initial implementations of an active learning curriculum in his physics course at Ohio State. In particular, the task of this professor is to evaluate the effectiveness of the learning activities he has already developed. Therefore, he will principally address the assessment problem and interact mainly in that aspect of the consultative discussions. His experiments during this time period will involve introducing the same concept to the class in two different methods. For one period, half the class will be introduced to a concept in a lecture format and the other half to the same concept in a studio physics group work format. A second experiment will repeat the process for a different concept but with the groups reversed.

There are several issues that we will look at and evaluate in this experimental project. Can we develop a suitable tele-computing environment and multimedia products to support effective consultations of this sort? Is the effort needed for this development commensurate with the benefit obtained? Is the consultative process, conducted at a distance between "strangers", as effective as the same process conducted locally? ... and if not, then what is the price? Can the same data serve multiple purposes if fashioned into a product that has multiple "specialized views" fabricated by the presentation interface?

The sponsorship of this project by the Gateway consortium is a testament to its efforts to join faculty work across institutional boundaries in novel and productive ways. For example, the ChemWrite project joins graduate students from the humanities with particular writing expertise to the Chemistry Department with its basic course for engineering students together to improve the writing skills of these potential engineers. This Columbia invention will, after this project, have the raw material in our data to create their own documentary. Based on the WWW, this could in general inform instructors at other consortium schools how this Columbia innovations works, and in particular demonstrate a possible method for consultative help to flow to those faculty who may wish to experiment with an adaptation of ChemWrite at their home institutions.

Caveats

The purpose of this document and the accompanying ones is to provide "talking points" for discussion and negotiations among all parties during the week of 25-29 January. Therefore they should be taken as provisional and form the basis for discussion this week.

This project plan is a draft. The dates especially have not been checked against the respective academic calendars of Columbia and Ohio State, and are subject to change. The commitments of Proshare computers from the Gateway consortium via Dean Mort Friedman is also not firm. The attached documents are also in provisional form. For example, the proposed plan of reformative activities for the General Chemistry experiment have not yet been approved by the Professors Turro and Fine,

Nonetheless, I hope that these can promptly lead to productive discussions and closure on what the shape of this project will be.

With regards -- Norman Chonacky