

A Catalog of CoWeb Uses

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1 Introduction

Use of the *CoWeb* (or *Swiki*) is now two years long at Georgia Tech. Over 120 of these CoWebs, across some ten servers, have been created and used, by literally several *thousand* students. The inventiveness of the teachers and students has been amazing. Teachers (and, in many cases, students) have developed some tremendously innovative and useful activities for learning.

However, very few teachers have the time to look at other teachers' CoWebs, so the insight doesn't get shared with others who might use it! The invented activities are often transportable from one domain to another, but the inventor doesn't have time (or even a forum) for sharing it with possible adopters. There is a real need for a kind of catalog of uses for the CoWeb in order to share them.

This document is a first pass at a catalog ¹, to help inform other CoWeb-using teachers about the bright ideas of others.

Preceding the catalog is a brief section suggesting ways of combining these activities in a real classroom. We recognize that different styles of class will lend themselves more to some kinds of activities than others. Our description talks about the interaction between class style and content with our experience with the different kinds of activities.

The catalog itself is split into four sections, corresponding to the kinds of uses that we see in classes:

- *Distributed Information*: Where teachers and students are sharing information, and the CoWeb's role is to ease the collection and distribution of that information.
- *Collaborative Artifact Creation*: Where students are working to create an artifact (e.g., a collaborative paper) are using the CoWeb to gather the pieces, assemble the work, or just to coordinate the work.
- *Discussion and Review*: Where the CoWeb serves as a place to review something (papers, ideas, designs) and critique/discuss them.
- *Other*: Those uses that we don't have a category for yet.

An entry in the catalog has this form:

¹The authorship of this document is the *Collaborative Software Lab*, but that makes anonymous a number of people who made major contributions, some who might not typically be associated with the CSL. Colleen Kehoe of the CSL contributed enormously, as did Mike Manning and Tom Morley of Mathematics. Matthew Realf and Pete Ludovice of Chemical Engineer are among the contributors not typically encapsulated in CSL. Thanks to all of them!

1.1 A Name for a Sample Activity

Description: A general, brief description of what happens in the activity.

How to Set It Up: What was needed to set up this activity? What pages had to be created in the CoWeb for it to work?

Role of the Teacher: What did the teacher have to do to make this work?

Examples:

- `http://an.example.of.this.activity`
- `http://one.or.more.of.them`

How Successful Was It: Was it successful? How can you tell? What happened in the example(s)? What did we *WANT* students to learn?

Suggestions for Future Use: Ideas of how others might use this: A scenario of a different class, a description of when the activity might be used (e.g., as an early ice-breaker, etc.)

2 A Guide To Use

We have found that most successful use of the CoWeb involves four parts:

- Some introductory activities, often required, to get students thinking about the role of the CoWeb and learning about its mechanics.
- Some not-required-but-useful activity to convince students that it can be useful to participate.
- A period of open use by students, with a few activities.
- Some closing activities

Good opening activities are the Who's Who (Section 6.1) and Restaurant and Movie Reviews (Section 5.6). These help students to get used to the CoWeb and to posting and discussing in the CoWeb. They also demonstrate some of the usefulness of the CoWeb.

The Anchored Collaboration (Section 5.1) and Exam Review (Section 5.2) are good examples of not-required-but-useful activities to get students motivated to be involved. The Exam Reviews have been particularly useful to get students to realize the benefit of collaborating across the group, because the joint effort leads to more answers and more answers to explicit questions.

In Mathematics and Engineering, it's been harder to get students started in using the CoWeb. Appealing to students' benevolence to be involved in Collaborative FAQs (Section 3.2) has not been useful. Assigning project descriptions (e.g., Section 4.5) or hot-list creation (Section 3.1) generates some content, but doesn't generate much motivation to use it freely. The best activity we've come up with so far in these kinds of classes have been the Puzzles (Section 4.2).

In more design-oriented classes, where there is more than one possible solution to a question, the various review activities have been quite successful. The Expert Reviews (Section 5.3) have been well received by outside experts. Students seemed to use and enjoy the Fishbowl (Section 5.5) and Case Library (Section 4.1) activities.

Ending the class with extra credit opportunities is always popular with students. By giving extra credit for posting in a case library (Section 4.1) or a student advice page (Section 4.5) encourages students to reflect on their learning, but is also useful for the next class to use the CoWeb.

3 Catalog: Distributed Information

3.1 Class Hot Lists

Description: Students work together to create bookmark pages or “hot lists” that point to useful references all over the Web. The Computer Science class in Ubiquitous Computing did this – students were asked to find Web resources related to wireless networking, embedded computing, etc. and post the URLs to pages for others to use.

How to Set It Up: Just pages where the lists can go, and encouragement to use them.

Role of the Teacher: The teacher has to define the kinds of resources needed, and perhaps offer credit for contributing. In addition, the activities of the class that the teacher defines need to make use of the external resources—they need to make sense for the students.

Examples:

- <http://triton.cc.gatech.edu/ubicomp/>

How Successful Was It: I don’t believe any evaluation has been done so-far.

Suggestions for Future Use: Whenever resources are on the Web that others may find useful. It distributes the cost of finding resources across the whole class.

It’s particularly useful when the same CoWeb is used for the same class across terms. Those resources become available to “bootstrap” future classes.

3.2 Collaborative FAQs

Description: An FAQ is a *Frequently Asked Question* collection – questions that people frequently ask on a topic, and the best answers to those questions. Doing this collaboratively makes sense: The question gets asked once, and the *Recent Changes* page points out when new questions (and answers) get posted.

Lex Spoon set up the Minnow Squeak FAQ page which is used by thousands of members of the Squeak Open Source Development community.

How to Set It Up: There are lots of ways to go. The CS2340 FAQ lists all the questions and answers on a single page: A reasonable way to go when there are fairly few people involved (few hundred). In the Squeak FAQ, the FAQ page lists questions and there are separate pages for each answer.

Role of the Teacher: The teacher sets up the basic structure. Having the teacher post some of the questions (perhaps asked in class or in office hours) and answers is a great way of bootstrapping the process.

Examples:

- <http://minnow.cc.gatech.edu/squeak/FAQ>
- <http://coweb.cc.gatech.edu/cs2340/SqueakFAQ>

How Successful Was It: No evaluation.

Suggestions for Future Use: Could be useful in just about any class. This is particularly useful when reusing a CoWeb across multiple terms, because the questions will come up in every class.

3.3 Help Pages

Description:

Help pages can be created by teachers and students, collaboratively, in the CoWeb. They differ from the Collaborative FAQ activity (Section 3.2) in that the pages are explicitly created for help and they're created before the questions have arisen.

The examples below offer help on Chemistry and Calculus III at Georgia Tech. Various topics in this subject are listed on the main page with links to specific descriptions and examples for each topic. Each link can be followed and there are text boxes throughout the pages prompting students to enter questions which will be answered in a timely fashion by TA's who monitor the pages.

How to Set It Up: The set-up in the CoWeb was fairly simple: The designer only had to create the page and the topic list and link to the other pages from there.

Role of the Teacher: The professor played a small part in the design of this part of the CoWeb. The page design was mainly left to the designer with minimal suggestions from the professor. Notes and examples included in the page are from actual GT lectures.

Examples:

- <http://math36.math.gatech.edu:8080/model/548>
- <http://math36.math.gatech.edu:8080/model/827>
- <http://math36.math.gatech.edu:8080/model/545>
- <http://math36.math.gatech.edu:8080/model/595>
- <http://math36.math.gatech.edu:8080/model/596>
- <http://math36.math.gatech.edu:8080/model/597>

How Successful Was It: The success of this page was difficult to monitor. Although the opportunity to post questions was there, it was not utilized by students.

Suggestions for Future Use:

These pages would be extremely useful for struggling Calculus III students who would like supplementary material in order to learn complex material better. The examples and notes on these pages are easy to follow and understand.

3.4 Homework Hand-In

Description: Students are assigned homework which results in text or other computer-based documents that can be shared on the CoWeb. There are several interesting aspects to this idea:

- It lets everyone see what everyone else is doing.
- It helps to generate activity in the CoWeb.
- It creates material for discussion and later linking.

There is a potential ethical problem, though. As teachers, we are not allowed to post grades. By requiring posting of homework, we are requiring students to make public what we are about to grade. It's a gray area whether this is an invasion of student privacy. Worse yet, on the CoWeb, it's publically available *to the entire Internet!* Can a future employer go back and see how badly a student did in a particular class this way?

On the other hand, students generally *like* handing-in assignments this way. We get a lot of feedback from students saying that they find this convenient, useful, and even fun.

Some solutions:

- Let students hand-in things on-line, but give them the option to delete the material later.
- Place a username/password lock on the CoWeb so that only students can get into it.
- Provide an optional way of handing-in things not on-line.

4 Catalog: Collaborative Artifact Creation

4.1 Creating a Case Library

Description: In the Computer Science class *CS2340, Objects and Design*, students are offered extra credit for writing up their class projects (or additional design/programming projects) in a way useful to future students. The class projects had to have recieved a 90 or better (an "A") in order to be able to post them – future students are most interested in looking at examples that got A's, then those that did not. Students get one to five points *added to the bottom line of their grade* (i.e., 1-5% of their final grade!), so it's worthwhile to them. Points are awarded based on the amount of effort that the

student is believed to have put into creating the case. Excellent cases include corrections to what was graded down on the project, description of the design process, strengths/weaknesses analyses of the project, etc. Cases have included tutorials, new projects, descriptions of group process, and new projects (e.g., computer music, 3-D computer graphics, and teaching programs). A nice feature of this structure is that multiple solutions to the same problem appear, in a large enough class.

How to Set It Up: The setup in the CoWeb was pretty simple: The teacher only had to create the Cases page.

Role of the Teacher: The teacher has several roles in this activity:

- The teacher has to announce the extra credit activity, and hype it some in the class to draw attention to it.
- The teacher has to grade the extra credit. In CS2340, students are required to send an email to the teacher with the URL of the case. This makes the job of grading a bit easier for the teacher: He only has to walk the email and grade those.
- The teacher has to convey value for the cases to future classes. In CS2340, the teacher usually organizes the Case page to indicate what the cases are about (e.g., extra projects vs. assignments, tutorials vs. essays) and even what the better ones are. This conveys to the next class that the teacher actually reads and values them.

The teacher has to be cautious in creating assignments in future classes. Obviously, the exact same problem can't be used term-after-term: The answers will be posted. However, future problems can *build* upon the cases. In CS2340, new problems are often chosen recognizing that part of the solution can be found in the Cases page, so new problems can be more complex and more interesting (and require the student to use the Cases page!).

Examples:

- <http://cweb.cc.gatech.edu/cs2340/Cases> is where the CS2340 Case Library is being created.

How Successful Was It: The first instance of a case library for CS2340 (in its quarter-length form, CS2390) was *STABLE*. Mark Guzdial and Colleen Kehoe did an analysis of student use of *STABLE*. They found that students did use the case library, they were able to use it to improve their projects, and they learned more from the use of the case library. Learning was mostly in *design*. That makes sense – by learning to look at lots of different cases, students gained insight into design that they might not get just from seeing a few designs in class and in the book. They also have to look at cases differently if they're looking for code to actually reuse.

While we haven't done any learning studies in the CoWeb case libraries, we have done some usage studies and found that students *are* reading the cases a lot before projects are due. Students visit cases looking for code, looking for examples of what gets an A in the class, and looking for tips.

Suggestions for Future Use: A case library like this could be used in any design-oriented class. It's less useful in classes where problems have single answers — having multiple cases on the same single answer aren't too useful, unless the descriptions associated are good and come from different perspectives.

It's an important feature here that the *exact* same CoWeb is used every term. We did try to point to a case library created in the previous term in another CoWeb from a new CoWeb – students didn't go visit the other CoWeb. It was “far enough away” that students wouldn't visit the library.

4.2 Puzzles

Description: A set of problems are created for the students to work on. The problems are not of the open-ended type but focused around finding a particular “trick” that will open up the problem and provide a solution. The ‘aha’ moment is supposed to happen *in the CoWeb* by an open discussion around the puzzle taking place.

The puzzles are selected to be challenging – possible to solve at the end of class, hard at the middle, and requiring lots of reading ahead at the beginning of the class. Extra credit is offered to the person or group who posts the solution, *AND* extra credit is offered to the students whose postings *led* to the solution.

Matthew Realff and Tom Morley invented this activity in the Summer 2000 term. It was remarkably successful in that more than 30% of the class participated, which is more than any other activity (other than an assigned activity) in a Math or Engineering class! The challenge, however, is to come up with a problem at the right level of difficulty (see below).

How to Set It Up: Essentially pages have to be created at two levels. The first level introduces the puzzle activity and defines the scheme by which credit will be given. A list of the puzzles is given on this page. Then the specific puzzles themselves are given on the pages linked off of this page.

Role of the Teacher: There are two main roles for the teacher. The first is in creating the puzzles, which takes time. The puzzles need to be of varying difficulty so that different students can participate, and there must be the notion that several ideas are required for its eventual solution, in other words if the puzzle is completely ‘gestalt’ then no discussion is worth having. The second role is that the teacher needs to ‘guide’ the solution process by commenting on the intermediate discussion, trying to avoid routes that will lead nowhere, and encouraging others to use what has been posted to make the next step or to refine the answer.

The trick is to pick problems:

- At the right level of difficulty – possible, so that students don't get disheartened, but seriously challenging so that it's not a race to post the answer.
- With multiple correct solutions. This part turned out to be really important. Otherwise, the top student posts the right answer(s), and the activity ends.

Examples:

- <http://math36.math.gatech.edu:8080/model/1118>

- <http://math36.math.gatech.edu:8080/model/1250>
- <http://coweb.cc.gatech.edu/process/13>

How Successful Was It: In terms of participation, it was one of the best Engineering and Math activities that we've yet invented.

Was it successful? First it is necessary to define one's criteria for success. Were the puzzles solved yes. Did students learn something by solving the puzzles yes. Did it result in significant use of the coweb outside of the puzzle activity no. These are all easy measures to evaluate, since you can look at the student solutions and see that they solved the puzzles and that the material was not covered in another format and yet students were able to talk about it in class.

The problem is that the better students will tend to 'cherry pick' the easy puzzles and dominate the puzzle solving. Thus it can lead to students being *discouraged* from using the coweb because they know that the puzzles will have all been solved. There would appear to be an easy fix to this, just make sure there is an overwhelming number of puzzles. However, the teacher effort is now increased tremendously. There might be the opportunity for *student-driven puzzle creation*, but this will have to be closely watched to ensure that the puzzles are correct and lead to meaningful learning.

Suggestions for Future Use: It's clearly applicable to any class with technical content and requiring problem-solving. I would suggest that this be used to support learning of material that is related to the curriculum but not essential for it. I used it to get people to apply concepts they had learnt in class (such as cycle time of a batch process) to more advanced examples. It can be used throughout the course and new puzzles added, I would not suggest that puzzles be removed.

4.3 Collaborative Hypertext

Description: This activity was invented by Patrick Ledwell in a class on Computer-Supported Collaborative Learning and was actually used in a class taught by Kavita Phillips. A hypertext document (in the example below, Robert Coover's *The Babysitter*, is posted into a series of CoWeb pages. Students edited each page and inserted a symbol (e.g., [*8*]) to suggest where the reader might go next. They also wrote up what they saw as interesting or emphasized in the path that they were constructing.

How to Set It Up: It's a pretty heavy set-up. (A similar task with less set-up time is the Adventure Game activity in Section 4.9.) The teacher or designer has to create lots and lots of pages, perhaps scanned.

Role of the Teacher: The teacher needs to actually assign the activity and encourage it – it's pretty hard to do. But it's an interesting activity with a real, public product. It's an activity that is hard to do outside a CoWeb.

Examples:

- <http://minnow.cc.gatech.edu/hypertext/>

How Successful Was It: No evaluation.

4.4 Student Extra Credit Link Lists

Description:

The links for this page allow students in any type of math class to have access to various types of mathematical assistance. These links can be internal to Georgia Tech; however, most links are to tutorials and other informational web sites about all levels of mathematics. **How to Set It Up:** The set-up in the CoWeb was fairly simple: The professor only had to create the page so that the students could edit the page as necessary. **Role of the Teacher:** The professor simply had to monitor the page for any new links which may have been added by a student. Once a new link had been detected, the professor had to validate that the link was indeed beneficial to other students in order for the person responsible for the link to get credit for the assignment.

Examples:

- <http://math36.math.gatech.edu:8080/model/749>
- <http://math36.math.gatech.edu:8080/model/606>

How Successful Was It: An actual quantity of hits to each page was not recorded, so in essence the utilized benefit is hard to determine; however, these pages have the potential to be of a significant help for students.

Suggestions for Future Use:

As mentioned before, future students could access these pages to find readily available help in a wide range of mathematics courses.

4.5 Student Advice Pages

Description: Students are invited to provide advice to future students.

- In Tom Morley's Math classes, students are asked to do this for credit. They describe how they solved past MATLAB problems in the class.
- In Mark Guzdial's CS class, students are asked to do this to help future students. They are asked to describe *Surprises*: Things about the class that they wished they'd known at the beginning of the class.

Comments from students and log file usage suggests that later students do actually go and visit the pages.

How to Set It Up: The set-up in the CoWeb is fairly simple. The professor only has to create the pages so the students could edit the page as necessary. The professor also has to encourage use, which can mean talking about it in lecture and/or encouraging use in the CoWeb (e.g., posting notes "Nobody has anything to offer?" and putting it in the *HotLinks* list.)

Role of the Teacher: In Math, Tom simply had to open each link after the project was due in order to determine if all of the requirements had been met. The links are labeled using the students' names who worked on the activity that is being commented upon.

Examples:

- <http://math36.math.gatech.edu:8080/model/768>
- <http://math36.math.gatech.edu:8080/model/840>
- <http://coweb.cc.gatech.edu/cs2340/230>

How Successful Was It: This assignment allowed the students to become familiar with the CoWeb and gain experience with a minimal amount of coding. It also serves to make connections between more senior and more junior students.

Suggestions for Future Use:

Future students could direct attention to these pages for help with projects. In the Math class, all the students' pages are at the top of the "class" page. Although numerous links are included on this page, most contain the same content and are easy to navigate through.

4.6 Managing a Design Process

Description: In several classes, students are engaged in a term-long design activity. The students need to keep the teacher (and the rest of the class, in the case of whole-class reviews of student progress) abreast of where the project is at each point in the process.

The CoWeb can help in this design process. In Irfan Essa's *Digital Video Effects* course and in Janet Murray's *Advanced Design and Production* course, students used the CoWeb to post their scripts at the right point, their storyboards at the right point, and each of their milestones for review by other members of the group and by the teacher. A review of this activity by Chrissy Hess for her IDT MS thesis showed that students used these milestone postings as anchors for discussion (see Section 5.1) and as a way of sharing collaborative work. Janet actually uses the CoWeb in class to walk through student work for class presentation.

How to Set It Up: The set-up can vary dramatically. In Irfan's class (as can be seen in the first example below), students were expected to post the various parts at the right time, but Irfan didn't actually create the pages where the students posted their milestones. In Janet's class, she created an extensive outline that students filled in at the appropriate points.

Role of the Teacher: This kind of structure can actually be an aid for both the teacher and the students. It structures the process for the students, and it makes it easier for the teacher to evaluate project process.

Examples:

- <http://swiki.cc.gatech.edu:8080/dvfx2000/27> – one group's example step-by-step postings.
- <http://pbl.cc.gatech.edu/lcc6114> – *Advanced Design and Production* where each phase is posted here for presentation and discussion.

How Successful Was It: Unknown.

Suggestions for Future Use: The design-process guide use of of the CoWeb could work in many other design-oriented classes on campus. One hindrance, however, may be the lack of read-protection on pages. In classes where students are competing against one another on the same problem, students will not be willing to discuss in plain view of the competitors.

4.7 Collaborative Writing

Description: Students collaboratively write papers in CoWeb pages. There are several disadvantages to traditional collaborative writing in classes:

- Wendy Newstetter noted a phenomenon in team projects called the “staple-together model.” On the first day of the project, pieces are assigned to group members. Everybody does their own piece, and on hand-in day, everyone brings in their piece to be stapled together and handed-in. Nobody ever reads each others’ pieces, nobody ever learns what the others learned. Very efficient for work, very inefficient for learning.
- Drafts get passed around via email. Pieces get updated in parallel and later have to be merged.
- Not everyone has the same word-processor.
- The copy to be updated is always on the hard disk of the team member who didn’t come to the meeting.

On the CoWeb, collaborative writing occurs in pages that everyone can edit from anywhere, in plain text with a little HTML for formatting. There is only one version ever, and it always resides in a globally accessible space. Even better, the *Recent Changes* page identifies when the page is edited – but not where. To find out where the change occurred, students have to *READ THE TEXT*, a far cry from the staple-together model. It’s less efficient in one way, but more efficient in the way that matters for classes.

How to Set It Up: Mindy Millard-Stafford invented this activity in the Georgia Tech CoWebs, and she’s used a couple of different setups. The first time around, she assigned students to topics. Her TA created pages for each team, and they simply edited the page².

The second time around, her TA created the topic pages and put in “sign up” numbers (e.g., four numbers for four slots). Students signed their names next to the numbers for the topic that they wanted to write on. This version passed more responsibility on to the students.

Examples:

- <http://pbl.cc.gatech.edu/mindy> is Mindy’s general website with both of her writing terms.

²This first term, Mindy’s TA was Ben Hall, the person who coined the term *CoWeb*.

- <http://pbl.cc.gatech.edu/mindy/77> is the writing page of the more successful term.
- <http://cweb.cc.gatech.edu/cwcw> is an experimental collaborative writing CoWeb developed by Jochen Rick and Bolot Kerimbaev.

How Successful Was It: Mindy seems to like it – she’s done a variation of this since (see the Collaborative Glossary in Section 4.8). Her students seem to find the approach avoids some of the headaches of collaborative writing assignments.

Suggestions for Future Use: There are lots of other ways to use this that we haven’t explored, or just barely started exploring like collaborative poetry writing (see the CWCW CoWeb) and the collaborative adventure game (Section 4.9). One could imagine collaborative code writing or even proof writing.

4.8 A Collaborative Glossary

Description: Students collaboratively write a glossary of terms related to the topics of the course. In Mindy Millard-Stafford’s summer course at Oxford, they did this for credit.

How to Set It Up: The teacher has to help students piece out what is each person (or group’s) portion of the topic to document. Pages need to be created for the glossaries (perhaps one page per document, but at least some starting pages need to be created).

Examples:

- <http://pbl.cc.gatech.edu/mindy/322>

How Successful Was It: Not evaluated

Suggestions for Future Use: This is a nice way of using a CoWeb to:

- Get students to collaborate on something of joint usefulness.
- Create a resource for future students to extend (or correct).
- Create an anchor for more discussion and more development.

Since many of the classes at Georgia Tech have a rich vocabulary, this is an activity which could be used in lots of places.

4.9 Collaborative Adventure Game

Description: The collaborative adventure game was invented by a now-anonymous Computer Science student the night before a big assignment was due. He created a few pages with a choose-your-own-path adventure game. Within three days, three dozen pages were created by over a dozen students. The game has been extended over time and re-created by other students.

How to Set It Up: The teacher did absolutely nothing! One could argue that their was no value to the activity at all, but my response is that *allowing* this kind of activity

encourages the students' sense of ownership over the space. Ownership has been shown to be important to motivation.

Role of the Teacher: Simply allow it!

Examples:

- <http://pbl.cc.gatech.edu/cs2390/489> has the header for two different games

Suggestions for Future Use: One could actually create a serious version of this activity where students explore ramifications of decisions – essentially creating a decision tree as fiction.

4.10 Close Reading

Description: This activity was invented by Greg VanHoosier-Carey. The teacher posts some text for students to read and analyze. As students identify issues that they want to explore, they insert asterisks around a phrase that they want to extend. On the phrase-created page, they in turn link to concept pages, which may be linked from many phrases. In this way, a network of prose → phrase → concepts are linked across many examples.

How to Set It Up: The set-up is more intensive, involving uploading lots of text.

Role of the Teacher: The teacher has to assign the activity, as it's probably more than students would willingly start.

Examples:

- <http://pbl.cc.gatech.edu/lcc2210/4>

How Successful Was It: Not evaluated.

Suggestions for Future Use: One could imagine using a similar close reading technique to collaboratively analyze data, programs, or other textual material.

5 Catalog: Discussion and Review

5.1 Anchored Collaboration

Description: Anchored collaboration was the original reason for the CoWeb! Anchored collaboration as an activity was invented by Jennifer Turns and Mark Guzdial. Something interesting is posted on the Web for students to review, and pages for discussing that something-interesting are set-up as one-clicks from the original anchor page. Jennifer and Mark's research suggests that anchored collaboration leads to more extended and still on-topic discussion than in spaces like newsgroups (or like WebCT).

How to Set It Up: Anchored collaboration is really easy to set up in the CoWeb. The anchor is typically an assignment or homework definition (probably on a locked page so that the students know that it's from the teacher), with a commentary page linked to it.

Role of the Teacher: The teacher does have to post the anchors and create the collaboration/discussion pages, so it's a little bit more work than just posting a "Discuss here" page.

Examples:

- <http://coweb.cc.gatech.edu/cs2340/581> is the assignment definition page from CS2340.

How Successful Was It: As mentioned, the anchored collaboration analyses of CaMILE (CoWeb's predecessor) showed that students talked more extensively in anchored discussions than in traditional newsgroup-like discussions. We haven't done a similar study of CoWeb anchored discussions.

Suggestions for Future Use: Just about any class that has interesting things to talk about can use anchored collaboration to anchor (and thus focus and prolong) student discussion.

5.2 Exam Reviews

Description: This is a variation of Anchored Collaboration (Section 5.1) where the anchors are problems like those that can be expected to be on a Midterm or Final examination. Students are encouraged to post solutions, questions, or critiques of other solutions.

It's a great activity because it creates a situation where it's perfectly natural for students to admit "I don't understand X – could someone explain it to me?" Discussion actually focuses on learning topics in the class, not how to get the homework done or when the assignment is due.

How to Set It Up: The teacher posts the problems (e.g., taken from previous exams) and creates a page for each problem where answers and questions can be posted.

Role of the Teacher: The teacher role here is fairly sensitive. After the set-up, the teacher *must* appear for the exam review to be successful – if the teacher isn't there, the students see no value in posting answers. The teacher's job is to respond to the answers and questions. But if the teacher ever says "That's right!" the discussion promptly ends, and students simply memorize the "right" answer. I have found that it's more successful (in terms of keeping the discussion going):

- To point out when an answer is wrong.
- To point out when a correct answer is limited or is only one of several possible solutions.
- To say absolutely nothing if a completely correct answer is posted. Then, other students feel free to ask questions and critique the answer, and perhaps learn something in the process.

Examples:

- <http://pbl.cc.gatech.edu/cs2390/114>

- <http://coweb.cc.gatech.edu/cs2340/35>

How Successful Was It: Students identify (in surveys) that this has been one of the most useful activities in the CoWeb is CS2340 and CS290.

5.3 Expert Reviews

Description: Expert reviews were the basis of *CoOL Studio* (Collaborative On-Line Studio) developed by Craig Zimring, Sabir Kahn, Saif ul-Haq, and David Craig, all of Architecture. The activity was used in a graduate class in Architecture.

Students in the class were designing court houses for a competition. Students posted “pin-ups” of their designs on CoWeb pages. Craig knows lots of courthouse architects, so he found several who would be willing to review the students designs and comment on them via the CoWeb. At two points during the term, experts were invited in to comment on student work, and students were invited to engage the experts in a dialogue.

How to Set It Up: Obviously, one important need here are the experts. Most experiences with these kinds of situations (sometimes called *tele-mentoring*) report that experts are often willing to participate, but finding them can be hard.

A related important part of the setup is making the space friendly to the *Virtual Critics*. On the front page, there is a page that basically says “Virtual Critics go here.” On the Virtual Critics page, there is a brief page of instructions on how to edit, and a list of pages named for each critic. A critic clicks on his or her name, and then sees a list of pages that he or she is being asked to review. Comments can be placed on individual project pages, or on the critic’s own page. (Students used the *Recent Changes* page to find the comments, wherever they were posted.)

An important issue here was how the students were to present their work. Originally, students were asked to create *Project* pages and *Research Diaries* about what they found out while working on their projects. This didn’t really work. The Project pages were unsuccessful, in part, because students were used to working in physical space, and they found it quite a significant task to figure out how to convey their physical design work on a Web page. Students just didn’t keep Research Diaries.

Instead, each student (or team of students) was asked to assemble *Project Review* pages explicitly for the critics to use in reviewing the project. These Project Review pages often did link to Project pages for more detail, but the main reviewing of student work occurred from the Project Review pages created just for the expert review activity.

Role of the Teacher: The teacher’s role *on-line* is relatively small in the expert review activity. The teacher needs to get the experts — which can be a big job — and then arrange for the setup. The teacher doesn’t have to be one of the reviewers.

Examples:

- <http://pbl.cc.gatech.edu/cases/> is where CoOL Studio is found.

How Successful Was It: David Craig has written a very interesting evaluation of CoOL Studio, based on interviews with students and reviewers. His findings:

- The reviewers found it to be a great activity – they really enjoyed interacting with one another. Courthouse designers don't often get the chance to see how one another critique student work. They found it fun.
- The students found it to be less valuable. By the time the experts commented on student work, students were often way past those issues. Dialogue didn't really work with the rare visits of experts. But there were times that it was valuable to students.

Suggestions for Future Use: The general issue of review by experts, common in Architecture, could certainly be used in other design-oriented classes. We've been trying something similar in Computer Science HCI classes.

5.4 Student Curated Galleries

Description: This activity was inspired by the expert reviews in Cool Studio but differed from it in several ways. This activity was used by a freshman studio class in Architecture (approximately 12 students).

Students in the class were each researching and designing something for a picnic in Piedmont Park (a six-week long project). Students created electronic versions of their work and placed those images with accompanying text into a gallery that contained several projects. The teacher had chosen a theme for each gallery and students chose which gallery their work fit into. Several critics were then invited to view the students' work and leave comments in each gallery. A "general discussion" page was also provided for more general comments on the work and the concept of the online review. After the comment period (1 week) the teacher reviewed the comments with the class in a "debriefing" session.

This review differed from the original expert reviews in the following ways:

- The review was conducted at the midterm, so that the comments from the critics could be incorporated into students' work as they progressed.
- Student work was grouped into themed galleries. This limited the number of different "things" critics had to look at and allowed them to consider several projects side-by-side. It also provided a neutral display space for student work and critic commentary (as opposed to "John's project page" which is a more personalized space).
- The presentation of the images and text was highly structured and limited in space. In addition to creating a uniform, professional look for the galleries, it simplified the task for students in choosing how to present their work. It also allowed for a more sophisticated presentation technique than most students would be able to create on their own.
- The critics used were not experts on the subject of picnics or Piedmont Park. Most were practicing architects with a wide range of general knowledge about architecture.

- The students were second-semester freshmen who were still learning about expert reviews, how to present work, and how to interpret comments.
- Comment boxes were used at the bottom of each gallery and discussion space to allow critics to add their comments. Unlike in the previous expert review, critics could not intermingle their comments with the students' presentations.
- Critics were not assigned a set of galleries/projects to review. Since there were only 4 galleries with 6 images each, all critics were requested to review all of the galleries.
- The review was set up to take the place of an in-person review in the class schedule. It was not presented as an extra activity, but rather as the only review activity for that week.

The things retained from the original expert reviews were the techniques for introducing critics to the site, the class project, and the CoWeb technology.

At the end of the term, another set of galleries was prepared that only had two students per gallery and allowed more and larger images. Critics were not able to review this work before the semester ended.

How to Set It Up: As in the original expert reviews, experts had to be recruited. The teacher recruited several colleagues who agreed to participate, but in the end, only about 2/3 were able to leave comments. (We're not sure why the others didn't.)

We again included a "CRITICS CLICK HERE FIRST" link on the main page that explained the CoWeb, some context for the assignment, and why we were interested in online reviews. Critics were then instructed to click on their name and fill in a short bio as a warm-up exercise. We gave the critics a week to complete their reviews and sent a reminder email toward the end of the week.

Before any of that, though, the site itself had to be set up. Together the teacher and a research assistant (who acted as technical support for the review) designed the organization, layout and functionality of the gallery. The result was a fairly complex web page that used JavaScript to flip rapidly through images and related text. To hide the technical details of the page from the students, the *forms* feature of the CoWeb was used. Instead of the normal Edit window, the student is presented with a form with instructions to "Put the filename for Image 1 here" and "Put the text that goes with Image 1 here". Another file contains the JavaScript/HTML and tells the CoWeb where to put the information from the form in the resulting page. Creating, testing, and installing the form requires at minimum and understanding of HTML, how to create files and how variables work. It also requires access to the CoWeb XML files and the ability to restart the server.

After the gallery pages with the forms are set up, students need to create the images, upload them to the CoWeb, and fill in the gallery form.

Role of the Teacher: The role of the teacher is to:

- Recruit the critics and help them understand the point of the online review.
- Define the look and structure of the gallery, if desired. (Note that the gallery does not have to be technically complex or use the forms feature. That is simply the choice we made, given that we had the expertise available.)



Figure 1: The Architecture Review Page: Clicking on one of the thumbnails shows a larger picture and its associated caption

Title [Project Name] [Date] [Page]

What does this page do? (Please describe the page in your own words. It will be used to generate a list of links to the page from the main page.)

Use the following instructions:

- Images should be placed in the gallery. These are the only way to display images. If you are not allowed to use images, the page doesn't work. The images should be placed in the gallery. The images should be placed in the gallery. The images should be placed in the gallery.
- Images should be placed in the gallery. These are the only way to display images. If you are not allowed to use images, the page doesn't work. The images should be placed in the gallery. The images should be placed in the gallery.

What is the title of the page? (Please describe the page in your own words.)

What is the description of the page? (Please describe the page in your own words.)

What is the name of the page? (Please describe the page in your own words.)

What is the text of the page? (Please describe the page in your own words.)

Figure 2: The Form for the Architecture Review Page: Students defined the review page by filling in the form. The first text box asks for the overall description of the page, then come a series of text boxes for (a) a file name of a picture and (b) text to go with the file name

- Set up the introductory pages for the gallery, critics instructions, etc.
- Our teacher chose to monitor the activity in the gallery during the review week and remind the critics to participate as needed. He also participated in the General Discussion and thanked the critics publicly at the conclusion.
- Debrief the students on the outcome of the review to help students interpret and build on the feedback they got and to share it across the class. This may be less critical for more advanced students.

Examples:

- <http://herring.cc.gatech.edu:8080/2cool/3186> is the Midterm Review Site.
- <http://herring.cc.gatech.edu:8080/2cool/3379> is the Final Review site

How Successful Was It: The Midterm review went very well overall. The teacher was pleased with the projects of most of the students and with the quality of the comments from the critics. He did note that the scanned in pencil drawings didn't come across as clearly as the photographs. For the Final review, he had students include more photographs.

Several of the critics commented in the General Discussion that they found the experience interesting and that they were looking forward to the Final review. One critic did point out however that the images lacked communicative power (perhaps due to their size and resolution) and that the text was more informative.

Students commented during the debriefing that the gallery was very easy to use and that they liked the format. Later on, some commented that they wished the images could be bigger and that there could be more of them for each person (which we did for the Final review). In a survey given to the class at the end (to which half of the students responded), most found the critics' comments interesting and somewhat influential on their projects. They also read the comments for other students' projects and found them interesting but less influential on their own work. Most also said that they understood the critics' comments better after discussing them with the teacher.

One problem with the review was that not all the critics participated in a timely manner (or at all). This is not surprising given that they are taking time out of their own busy schedules, but it makes their feedback less likely to be considered after the class has moved on. Non-participation by some critics should be taken into account when planning the number needed.

The Final review lost considerable momentum because it occurred during one of the busiest times of the year for both students and instructors. Students and instructors were involved with several large end-of-the-year projects that took precedence over the online review. Students did ultimately complete galleries for the Final review, but there was not time before the end of the term to have experts comment on them.

Suggestions for Future Use: This activity could be useful whenever students are creating objects that can be shared electronically and might benefit from expert critique.

The reviews require a fair degree of planning and time to make them run smoothly. This is particularly important when outside critics are volunteering their time to participate. Variations on this activity include having students in the class act as critics for each other, having two classes at the same level act as critics for each other, and having a more senior class act as critics for a more junior class. A possible issue in extending this activity to other fields is that they lack a tradition of expert critique as a learning activity. Experts (or students) in other fields may need more guidance in understanding the point of the activity and making appropriate and useful comments.

5.5 Fishbowl Reviews

Description: In this activity, four students were selected by their instructors to have their work placed in the online “fishbowl” where it could be reviewed and critiqued by other students and instructors. The rationale behind the Fishbowl Reviews was that it would be useful for students and instructors to see and discuss how other students’ work progressed over time. All students in the class (about 150) started from the same initial assignment and the Fishbowls also intended to illustrate the range of problems and approaches within the initial assignment.

Each week, teaching assistants would track down the Fishbowl students to collect that week’s work from them. They would discuss with the student how the work should be scanned and arranged on the page. The teaching assistants did the actual scanning of the drawings and photos to avoid giving the Fishbowl students too much extra work. The teaching assistants created a new CoWeb page for each student each week and put the scanned images into that page. The Fishbowl students were then asked to add some text for each image and to rearrange the page as they desired.

The Fishbowl Reviews were available for comments from anyone as soon as the pages were created. Students and instructors were invited to post critical comments and questions regarding both the assignment and the design process. Suggestions for ways to advance the presented projects were also welcome.

How to Set It Up: The only thing that needs to be set up on the CoWeb in advance is the initial “Fishbowl Reviews” page. This page should explain the purpose of the reviews and contain an invitation and suggestions on how to participate in the reviews. Subsequent pages for student work can be created as needed by either teaching assistants, teachers, or the students themselves.

Students also need to be recruited to participate. In our case, students were chosen based on the quality of their work on previous assignments and their willingness to participate (which, in fact, declined as the semester wore on). We also considered having students in the Fishbowl for a short period (a few weeks) and then adding a new group of Fish to give other students a chance to participate.

Role of the Teacher: The role of the teacher is to:

- Recruit the students for the fishbowl.
- Make sure that work is added regularly to the site.
- Perhaps seed the discussion by adding comments to the Fishbowl pages.

Examples:

- <http://herring.cc.gatech.edu:8080/2cool/Fishbowl>

How Successful Was It: Overall, the results from the Fishbowl Reviews were somewhat disappointing, but did provide some important lessons that might make them better in the future. Some things that worked well were:

- Having TAs scan and upload drawings and documents. This kept the burden on the students in the Fishbowl to a minimum which I believe was important in getting them to participate. It took the TAs several hours each week to scan, size, and compress the images, but as a result the images turned out very well.
- Choosing interesting and high-quality projects. Most people who looked at the Fishbowl agreed that the students were doing excellent work. The diversity of what was presented could have formed a very good basis for discussion, I believe. How to actually bring the discussion about, however, was another matter.

Things that were problematic were:

- Getting other students and instructors to participate. It was an optional activity, so as the semester got busy, the Fishbowl got less attention. The first set of work posted did get viewed and some comments from students, but the comments rapidly tapered off. Few instructors left comments, if any. At this point in the semester, most of the instructors were unfamiliar with the CoWeb which probably played a role.
- Getting comments to be substantive. Many of the comments that were made were of the form “I like the way you did X.” More instructor involvement (and buy in) would have been useful in raising the level of discussion in the Fishbowl. Also, having a way to comment across the projects, pointing out parallels and contrasts, might have been useful.
- Students in the Fishbowl losing interest. After a few weeks one student stopped submitting any work and all students submitted less work as the semester went on. By the final week, students were no longer adding text to their images or rearranging them. One reason for this was that the class was getting very busy and low priority things such as the Fishbowl had to be dropped. Another reason, however, might have been that they weren’t getting much out of it.
- Communicating the point of the activity to instructors and students. I don’t think that we did a good job in communicating the point or value of the activities to the instructors, which in turn had an impact on the value that students placed on it. In general, it took longer than we expected to help the instructors picture how the CoWeb could be useful in their classes and then get comfortable with using it.

Suggestions for Future Use: This kind of activity can be useful in other classes where students might benefit from seeing how other students are approaching their projects. It makes the most sense in a situation where limited time or a large number of people make a face to face discussion unmanageable. A simpler scenario than the one described would be one in which there is a single instructor with multiple sections who can facilitate the discussion around the projects.

5.6 Restaraunt and Movie Reviews

Description: Students are invited to post restaraunt and movie reviews. It's really that simple, but it tends to be inviting and even addictive. In one class, after the restaraunt and movie review activities were started, students created book and "night life" review pages, too. What's especially interesting about this activity is that, over multiple terms, the review pages become quite rich and actually useful to students. It serves as an example of what a CoWeb can be for.

How to Set It Up: This is the easiest one to set-up: Simply create the review pages and post an invitation to post. Students get the idea pretty quickly.

Role of the Teacher: Nothing really.

Examples:

- <http://coweb.cc.gatech.edu/cs2340/32>
- <http://herring.cc.gatech.edu:8080/2cool/movies>

How Successful Was It: No real evaluation done.

Suggestions for Future Use: This is an easy one that carries across domains.

5.7 Expert Commentary and Annotation

Description: In the *Griffith in Context* project by Ellen Strain and Greg VanHoosier-Carey, experts were interviewed to create "voice-overs" for video segments from D.W. Griffith's *Birth of a Nation*. Ellen and Greg wanted a way for experts to review their voice-overs and provide commentary (on their own or on others). Patrick Ledwell set-up the Griffith CoWeb so that experts could listen to their voice-overs (in RealPlayer) or even watch the segment and see where their voice-overs will appear.

How to Set It Up: The set-up for this is just amazing. Patrick got RealPlayer to display audio and even video (synchronized with script notes!) within the CoWeb, so that the CoWeb could be used for annotating these materials.

Examples:

- <http://coweb.cc.gatech.edu/griffith>

How Successful Was It: The site didn't get that much use, really, in terms of annotation. But in terms of showing the critics something to get them excited about the process, and in terms of exploring some really neat new technologies, it was quite successful.

Suggestions for Future Use: This could be a really exciting use for a film or music class to explore.

6 Catalog: Other

6.1 Who's Who Page

Description: Students post brief introductions to themselves on a *Who's Who* page. They name each of their pages with their own names, by simply entering their names on the pages inside of asterisks, e.g., **MarkGuzdial**. They can then edit their page and put on it information about themselves (e.g., a picture, From then on, they can “sign” their name to a posting by simply typing **MarkGuzdial**. This will create a link to their home page.

The advantages of “signing” postings in this way include:

- In a discussion, you can easily pick out names (they're differently-colored, in most web browsers) and clicking on one tells you more about who you're discussing with.
- Each person's *Who's Who* page entry links back automatically to all pages where the person posted. This is useful in evaluation.

How to Set It Up: It's actually a little more than just creating a *Who's Who* page. First, the teacher has to really **encourage** use. In many classes, it's *required* to create a *Who's Who* page entry.

Role of the Teacher: Encourage, and even require participation.

Examples:

- <http://coweb.cc.gatech.edu/cs2340/2>
- <http://herring.cc.gatech.edu:8080/2cool/607>
- <http://minnow.cc.gatech.edu/squeak/8>

How Successful Was It: There has been no real evaluation of *Who's Who* as an activity, but there is an informal correlation that suggests *NOT* doing *Who's Who* can be damaging to participation (see below).

Suggestions for Future Use: The *Who's Who* activity seems to be almost *required* for successful use of the CoWeb! The correlation between use of *Who's Who* and successful participation is very high. *Who's Who* gets students used to the CoWeb, and provides them with a useful example of the mechanics. It may also help to encourage student ownership of the space.

6.2 Signup Pages

Description: A very common activity of groups is to need to choose a time for activities (“When can we hold this meeting?”) or to find members for activities (“Who's

available for lunch today at 11:30?”). The CoWeb turns out to be a great forum this kind of activity, avoiding a slew of email. Someone simply posts a page with all the options, and people visit the page and sign up for the option they prefer.

How to Set It Up: Typically, a group leader sets up the page and then announces it via email, with a deadline time when a decision will be made.

Examples:

- <http://guzdial.cc.gatech.edu:8080/squeakers.44>

Suggestions for Future Use: This particular activity is useful anywhere, not just in classes.

6.3 Collaborative Radio

Description: The Collaborative Radio project was an experiment in collaborative multi-media that was *not* text (per-se). At the Jukebox site, users could create *programs* assembled from MIDI, WAV, and AIFF files uploaded to the site. On a regular *schedule*, the server would play each program, by playing each sound file in order. The server was connected up to a low-power FM transmitter so that users could listen to their collaboratively-defined radio station from any FM radio on the same floor of the building as the server. Aibek Musaev also created a tool for allowing users to listen in from their desktop computers by downloading the same files and playing them in the order of the program.

How to Set It Up: It was actually fairly easy to set-up technically (though more complicated than simply creating a few pages). The CoWeb server is written in Squeak, which is very good at multimedia. It didn't take much to set it up the process to play the files. FM transmitters (very low-power) are less than \$25US.

Examples:

- <http://guzdial.cc.gatech.edu:8080/jukebox.1>

How Successful Was It: It was fun, but not very useful. Rodney Walker actually did a user evaluation of the Collaborative Radio. He found that users found the creation of programs a little too hard, and the quality of the output a little low to actually make it that useful. In other words, it was hard to do, and you wouldn't really listen much to the output. A future venture might try a more powerful transmitter, support MP3's, and provide a better interface for creating programs.

6.4 Classroom 2000 to CoWeb Connectivity

Description: Classroom 2000 (now *E-Class*) captures lectures in multiple media streams: URLs visited, slides presented, annotations on those slides, audio and video of the classroom. The lecture page shows a vertical timeline of the lecture with resources connected and the slides of the lecture. However, once captured, the lectures are "dead" – they are static material.

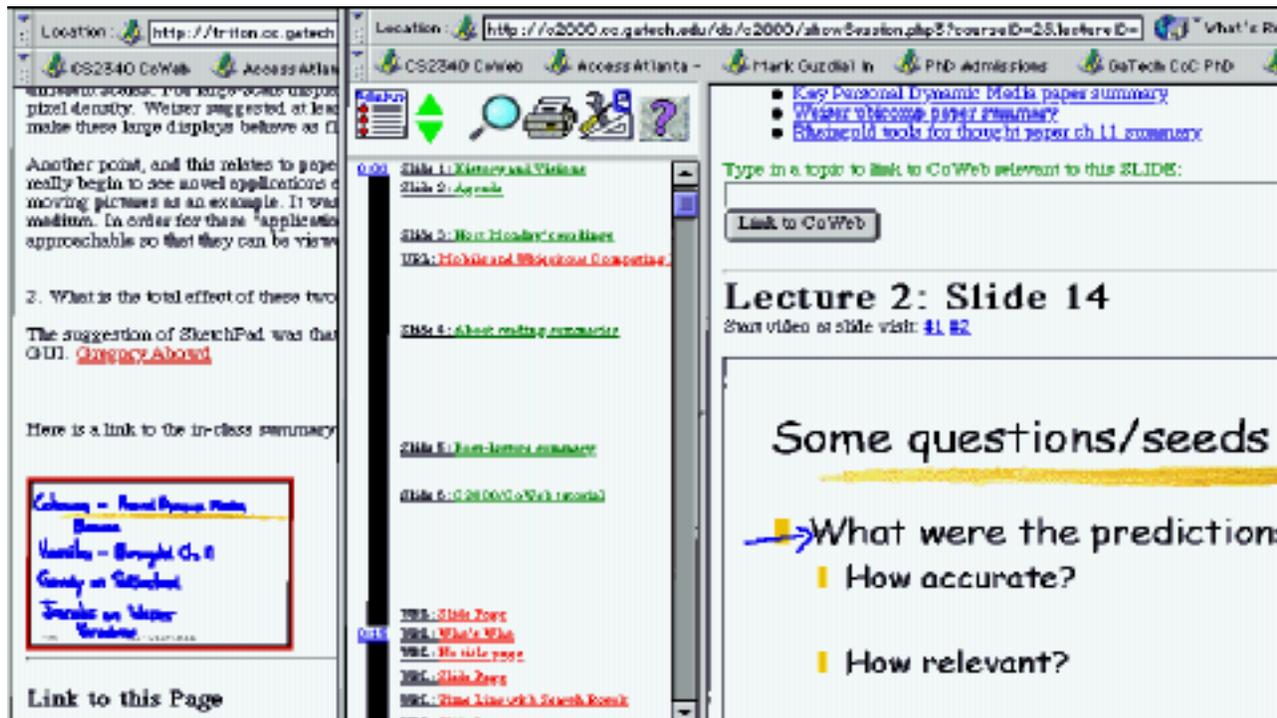


Figure 3: CoWeb page (left) connected to Classroom 2000 lecture (right).

By linking them to the CoWeb, the captured lectures can be extended. Students and teachers can link from the lecture slide to the CoWeb, which places a snapshot of the slide onto the CoWeb page (to get from CoWeb to lecture) and a link from the slide to the CoWeb page (to get from lecture to CoWeb). The CoWeb serves two purposes:

- The lecture can be extended through discussion and links to external resources.
- When the CoWeb is used in later classes, the older lectures can be found and reused through searches in the CoWeb.

How to Set It Up: The set-up is fairly complicated. The first version of the connection between Classroom 2000 and CoWeb was quite simple. A more sophisticated version was built that would automatically create pages that matched lecture slide titles. We are working to make this version widely available.

Role of the Teacher: It's not clear how to use this functionality well. We have tested it in two classes: *Ubicomp* (Ubiquitous Computing) and *CSCL* (Computer Supported Collaborative Learning). In the first class, Gregory Abowd made many links between lectures and the CoWeb himself, to encourage use. There, students did start creating links. In the second class, Mark Guzdial made no explicit effort to encourage link creation, so few links were created. But also, the CSCL class was much more discussion-based, so the slides and captured lecture were less useful.

Examples:

- <http://triton.cc.gatech.edu/ubicomp>
- <http://triton.cc.gatech.edu/cscl>

How Successful Was It: The activity was evaluated and a paper presented on it at CSCL'99. While student creation of links was not as great as we would have liked, students very much liked the combination. The sum seemed to be greater than the combination of its parts. The lecture provided content to anchor discussion, and the CoWeb provided a flexible, student-controlled space to explore and relate to the discussion.

Suggestions for Future Use: We are interested in exploring how it might be made more effective in discussion-oriented classes, and in trying to define student activities which utilize the combination well.

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