

# Planning Grant: Progress on Issue Resolution

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To place the planning grant issues in context, we restate the goals of our research proposal in terms of problems as viewed from different roles.

**From a teacher's perspective:** Given that similar courses are taught by different faculty at different universities using different mechanisms (Webct, PPT, Unix, Lotus Notes, traditional) and that active learning through research can be used through term papers and projects in courses:

- browse all to **instantiate** new offering, reusing what's appropriate
- **archive** ongoing course
- **create** focus libraries of valid sources for students research assignments

**From a student's perspective:**

- prior to and during taking course, students want to **browse** various offerings of courses for relevant exams, discussions, FAQ and similar items.
- to complete their project assignments, students need an archive which can support **technology** of objects found in DL (e.g., untar file, run xls program)
- support for **exploration** of DL

**From an administrator's perspective:**

- maintain **record** of actual course instances (accreditation, information requests)
- use information for **evaluation** purpose

In preparation for this proposal, we had been awarded a planning grant to investigate the following questions:

1. Is a digital library an effective way to store and organize teacher's and students' material, and what is to be stored?
2. What effort level is required to publish into and to maintain such a library? Are students and teachers likely to find this time- and cost-effective?
3. How difficult is it to use by faculty and students with varying technical backgrounds?

4. What organizational structure in a digital library will improve user satisfaction?
5. How can we measure the effects of student research via digital libraries on the rate of or improved learning in science and engineering courses?
6. Will students perceive an advantage in publishing their personal course portfolio into a digital library's persistent canonical format, as opposed to creating a personal website?

We should make it clear that by no means have we resolved the issues identified in the planning grant; on some issues we have decided on the approach that we should take as one being most likely to lead to success, on other issues we simply have gained enough understanding to realize what the real underlying problem is.

## 1 Course Archiving and Creation

**Bucket Granularity:** Current realizations of buckets are as digital objects of two levels - packages and elements; that is deemed insufficient to represent course buckets where a user might want to search for the 2nd exam in all offerings of CS451 for example. We plan to introduce another layer of specification of metadata such that search and presentation tools will understand course-related terms.

**Link Completeness:** Elements in a bucket may be links to other objects or buckets; what does the archive store in terms of transitive closure? This is really a reformulation of the age-old copy vs. pointer problem. We are contemplating providing capabilities for either but provide a set of tools that can display, for the publisher, outside references and can categorize them and provide common operations on them.

**Bucket Technology:** What technology should we use to implement the digital objects we have chosen as the representation: buckets? For the project we will use at the base level cgi scripts for buckets but use XML to specify our course model and JAVA for browsing and presentation tools.

**Technology Completeness:** How do we provide for accessing/displaying bucket elements not of common MIME types? This is really the archiving problem of regular libraries. How do they store material such that it is viewable, readable, and understandable in not only ten years but also hundred years. For example, who can read by now a 5" disk written by some DOS-run computer? The answer lies in specialized archives to which an element can point. For example, Microsoft might construct an archive that will be able to take a file produced by a Word program of any version and produce a readable file.

## 2 Course Reuse and Evolution

**Course Maintenance/Reuse:** How can a teacher readily update existing materials? How does an instructor indicate what materials from existing courses should be reused in a given course? The publishing and editing tools for course buckets will be aware of terms familiar to teachers such syllabus, assignment and exams.

**Course Evolution:** As courses and curricula evolve, the challenge is to maintain multiple distinct consistent configurations of course materials. The library must allow course contents, structure and deliver method to change from semester to semester. Evolution of a course should be possible without irrecoverable loss of prior version, except under direct and explicit control by the instructor.

**Course management:** Do we support various indigenous methods for managing, administering, offering, and evaluating courses or offer our own paradigm? The answer is neither. Actual course delivery is not the subject of this project. The DL should be an adjunct, not a competitor to such delivery products as WebCT, Lotus LearningSpace, or even instructor-specific directory organizations. Therefore, although direct student access to the resulting offering DL is possible, a more common mode of interaction will be for the instructor to unpack the offering into a “native” filestore of some kind, with which the students will interact directly. In some of these activities, the capability to attach annotations to DL elements is required.

### 3 Active Learning Support

**Active learning:** How can a digital library such as we propose support an active learning paradigm? The primary vehicle for learning is considered research through resource discovery. Digital libraries can support this process in general through the availability of document search mechanisms and, secondarily, by providing forums for publishing and archiving of student research products. DL’s also offer a possibility unseen in more conventional document collection – the possibility of an instructor’s developing a research library tailored to the needs of a particular course. Such a *focused research library* can offer higher precision and recall for student searches, and can allow the instructor to make easily available useful documents that would have been obscure or impossible to find via conventional means.

**Collaboration:** Does collaboration play a role in using DLs for active learning? We do not question the basic precept of the usefulness of collaboration in active learning but rather the usefulness in the context of DLs. The answer lies in our environment where we plan to deploy the library for the benefit of TechEd - the offering of a CS degree over the Internet at ODU. In that environment students are at different locations when learning takes place and communication is essential. Hence our proposal to provide simple tools that allow collaboration by means of the browser.

### 4 Cross-cutting Issues

**Content:** What actually constitutes the library we propose? From our study we plan it to contain buckets categorized along three dimensions: university organizational structure, time and people. In the first categorization we will have course-related material organized by courses offered by a department within a university. For each such course there will be buckets for specific offerings of a course over time. In addition faculty will create focused, quality annotated, research libraries to facilitate class research and students will create personalized portfolio buckets to take along after graduation.

**Access Roles:** Do buckets and library tools present different interfaces depending on roles/capabilities of user? We have identified the three roles of 'teacher', 'student', and 'accreditor' and we shall use automated user profiling and customizable bucket publishing tools to adjust for roles and capabilities.

**Privacy:** A large investment is being made at different universities to offer Web based courses for asynchronous distance learning. There is a need for digital libraries that can protect this investment in the intellectual property of all players involved.

**Bucket Intelligence:** In our approach, buckets have all the intelligence and not archives nor libraries. Hence the possibilities exists, for example, to imbue buckets with the ability to learn about related buckets having been published and to notify someone of this happening. How much intelligence is needed for UDLF buckets? Once we have implemented the base framework, only resources limit the amount of intelligence we can implement.