A. Executive Summary

A.1. Problem Statement

We focus on two key problems relating to students and scholarly communication: 1) preparing students to be effective communicators, and 2) increasing access to student research results.

1. Most graduates from US universities are not adequately prepared for the Information Age. These future scholars have little knowledge of electronic publishing or digital libraries. Because information technology is continuously evolving, it is not surprising that many students: are not prepared to communicate effectively through electronic documents, know little about how to make their research easier to find or to navigate through, have minimal knowledge about copyright or publishing policies, lack skills to submit full proposals and papers electronically, and have little understanding of how to create works that can be easily preserved for access by future generations.

2. About 50,000 U.S. students produce doctoral dissertations each year; even more write bachelor or master’s theses. Only a very small percentage of their research is published, in highly condensed form, in journals or monographs. Few theses circulate past their local libraries. UMI very rarely sells more than 7 copies per year of a typical dissertation, though their product Dissertation Abstracts is useful to identify completed dissertations. Interlibrary loan (ILL) services are the primary means of access to theses and dissertations and while this service is usually not for a fee, the time delay discourages its use. To acquire theses from ILL, one must first be able to identify what is useful or relevant; in most disciplines, finding such student works is nearly impossible.

These problems are serious, and while billions of dollars are spent to support student research, dissemination of findings is usually weak, “locking up” important knowledge and depriving students of the visibility they might warrant. This limited communication and access leads to many graduate research projects proceeding without knowledge of similar completed student investigations. In spite of millions of dollars invested in technology, most campuses have no digital library of works produced by their own scholars. Without outside guidance/assistance, many libraries do not have the infrastructure to put a digital library in place and the resources to support it simultaneously with traditional resources.
Though a growing number of free scholarly archives and electronic journals are available, few students are aware of the many ways that they can support learning and research – in school, in their jobs, and for life-long learning.

A.2. Goals, Objectives, Improvements

We believe, and adopt as our core goal, that theses and dissertations prepared by post-secondary students should be created and archived, by them, in suitable electronic formats. Whenever possible, students also should do this for other published works (e.g., preprints and reprints of journal or conference papers). Hereafter we refer to these electronically accessible works of students as “e-works”.

Other important goals of this project include improving the quality of e-works, making them more widely accessible (including through effective resource description and indexing), and integrating them more thoroughly into higher education. Students should learn to understand electronic publishing and digital libraries to the extent needed to prepare and upload their own works into open archives such as the Networked Digital Library of Theses and Dissertations (NDLTD), and to make use of these resources themselves for research. Universities should establish digital libraries that will dramatically increase access to higher-education research results and expand cooperation.

This project focuses on students and universities. Preparing e-works should become common practice at research universities. We plan to involve 100 U.S. universities, including at least 20 minority institutions and 40 Research I universities. Potentially over 100,000 students yearly will gain knowledge and skills through this program, with at least 20,000 submitting e-works, and many more using them.

Today’s electronic authoring tools, if properly used, can help students improve the quality of e-works. For example, by using the “comments” or “tracking features” in Word, “Acrobat Notes Tool” for PDF, “routing features” in Outlook, or the “discuss features” in Internet Explorer, students and mentors can interact, and members of students’ committees can share suggestions and criticisms. Instructors will use e-works in courses, as will students engaged in general browsing or research. In addition, students can enrich their e-works with hypermedia content and navigational devices/links (such as thumbnails and
bookmarks) to assist readers using their e-works. Once created, these works must be organized and
effectively represented for easy access and retrieval in digital libraries and open archives. Both students
and universities will save money as they shift from paper to electronic creation, submission, and
distribution. We expect greatly increased collaboration around these e-works.

A.3. Approach

By launching a Graduate Student Development Initiative (GSDI), this project will extend the 1996-
1999 FIPSE project “Improving Graduate Education with a National Digital Library of Theses and
Dissertations” (www.ndltd.org). It will go beyond doctoral and master’s theses to include undergraduate
theses, as well as many preprints and eprints, that will become part of the new “Open Archives Initiative”
(OAI; see www.openarchives.org). This project will vastly increase the number of universities and
students that benefit from digital libraries. It will expand the educational scope so that e-works are better
researched and written, use more multimedia in addition to narratives to demonstrate their points, are
easier to identify and to access, and can more easily be preserved. It will achieve a critical mass so that
GSDI will become self-sustaining and broadly supported nationwide.

A.3.1 Building upon work and support at Virginia Tech

Through GSDI, Virginia Tech's successful efforts with electronic theses and dissertations (ETDs) will
be disseminated to scores of other universities. Since 1997, all Virginia Tech master’s and doctoral
theses (over 2000) have been submitted electronically. More than two-thirds have some multimedia
aspect; the average size has increased from roughly 1 to 3 megabytes. This collection is accessed over
30,000 times per day. More than 80% of the ETDs have been accessed at least 100 times. Survey results
indicate local satisfaction with available training materials, workshops, and digital library services.

Virginia Tech supports GSDI, OAI, and NDLTD through its Digital Library Research Laboratory,
Library, Graduate School, and Computing Center. IBM, Microsoft, Adobe, and OCLC have further
leveraged funds from the recent FIPSE grant through over $1M in hardware and software donations.
A.3.2 Education about electronic publishing and digital libraries

GSDI will build upon the educational materials on electronic publishing and digital libraries developed for NDLTD. These materials must be updated and vastly extended to be more useful in workshops and for self-study. There is a strong demand to produce a variety of videos and other materials. Extensive usability testing of all materials is needed. New tools must be developed to help with the application of emerging standards like XML and the Dublin Core. To serve the needs of graduate students, GSDI will leverage over 7 years of experience with the Virginia Tech Faculty Development Institute (http://www.fdi.vt.edu/).

A.3.3 Dissemination

Following the example of Virginia Tech, over 80 universities worldwide have joined NDLTD. Each has committed graduate school staff, library personnel, and other stakeholders to contribute their time to implement programs for ETD creation and sharing. Almost half of these institutions are outside the U.S., giving U.S. students exposure to languages and research results from other cultures. Initiatives at foreign universities (e.g., in Australia, Brazil, Mexico, Portugal, Singapore, and Spain) will benefit all NDLTD members. Joint funding from Germany (300K EU last year) and the NSF ($80K for 2000-2001) is supporting collaborative research on multilingual federated digital libraries.

The PIs in this proposal have given over 200 talks about e-works. Most have been at other universities; repeat visits often are required before an institution can initiate ETD activities. An increasing number of universities send teams to visit Virginia Tech, to learn how to initiate ETD and digital library activities. Without further FIPSE support, the tremendous momentum generated may be lost, at a time when many more universities want to join the NDLTD and require assistance to participate.

The NDLTD universities form a collaborative federation. A Steering Committee, with many representatives, including those from southeastern universities, the Big Ten, the Association of Research Libraries, and the Coalition for Networked Information, directs overall strategy. The University of South
Florida (USF) hosted 225 people attending the March 2000 annual conference on ETDs, and Caltech will host the next conference, in 2001.

**A.3.4 Four key partners**

This project will promote post-secondary education through the GSDI, led by Virginia Tech and its four other partners. Each will play a lead role in addressing a key obstacle related to e-works. Each will disseminate project results to universities in their region, ensuring a stable base of growth nationwide.

USF will play a lead role in dealing with barriers to effective writing and communication faced by students. It will work closely with institutions throughout Florida, which has a state center for library automation. USF has an active writing center, and has obtained support from Microsoft to help develop and apply new tools to support student authors, so the quality of the language in e-works will improve.

The California Institute of Technology (Caltech) will take the lead role in teaching both the next generation of scholars and current faculty about their rights and responsibilities regarding scholarly communication. Students will develop a clear understanding of the importance of allowing researchers, teachers, and students ready, long-term access to electronic research materials. Key topics will include: scholars and the OAI, impact of access on the scholarly record, and legal issues surrounding copyright. Caltech will develop a package of educational materials, in a variety of formats (print, video, and Web).

The University of Iowa will focus on the use of ETDs and electronic scholarship to improve graduate education. It will develop specific ways to use digital technologies to respond to recent recommendations from national reports recommending changes in graduate education. It will shape GSDI to: enhance written and oral communication — as well as computer and other technology skills; prepare for diverse career options in a digital and global environment; and understand related aspects of technology transfer.

The University of Kentucky will ensure that key concepts of library and information science (creation and use of metadata and indexing to facilitate the organization and management of electronic data and to enable users to discover, identify, and harvest relevant and useful resources efficiently) inform the overall effort. Kentucky also will play a lead role in evaluation.
A.4. Evaluation

The Metamorphosis project at Kentucky, designed initially to evaluate the NDLTD, and building upon related studies of technology adoption, will guide our evaluation. At the beginning of the project, a baseline will be established by surveying attitudes, as well as knowledge and skills, at representative U.S. institutions. A three-year longitudinal study will track changes at those institutions, and assess the effects of each type of intervention provided by the GSDI. Surveys, focus groups, interviews, and studies of the nature and quality of all e-works will greatly extend our understanding of the results from, and educational effects of, the project. A quantitative assessment of the impact of this project will be obtained through distributed data collection by member universities as well as log analysis from server machines. Evaluation will occur at each project site, and, with their help, at no less than 10 other sites, so that the growth and evolution of the initiative is tracked and improved, with ongoing formative and iterative refinement of project materials. There will be extensive leveraging of other resources at each partner site. For example, evaluation studies at Virginia Tech will utilize NSF-funded usability labs, tools developed from an NSF-funded project for Web traffic characterization, and advice from the Center for Survey Research. All together, project partners will ensure that evaluation helps GSDI meet its important goals.
B. Submission from University of Kentucky

FIPSE 2000 – GSDI Evaluation -- Preliminary Draft 4/16/00

The GSDI is especially effective because:

- the six participating institutions represent a broad spectrum of academic foci, student populations and institutional styles.
- unique, self contained project products will be developed independently at each site then combined into an integrated program with extensible capabilities.

These characteristics are very beneficial to the project and offer exciting possibilities for summative evaluation. However the challenges they present for formative evaluation are recognized and addressed by the evaluation plan as well. To answer these dual needs, the evaluation plan is divided into two tiers -- the aggregate level (Tier One) and institutional level (Tier Two).

TIER ONE EVALUATION

Tier One addresses the overall goals and objectives of the Graduate Student Development Initiative. The outcomes associated with Tier One are:

1. To prepare students to be lifelong learners in the Information Age.
2. To prepare students to be effective communicators in the electronic environment, particularly in regards to electronic publishing and digital libraries.
3. To increase access to student research results.

GSDI’s effectiveness for outcomes 1 and 2 will be evaluated by studying student attitudes and competencies throughout the duration of the project at both participating and non-participating institutions using a specially adapted version of UK’s Metamorphosis research design.

Metamorphosis is rooted in established technology acceptance research and extends this work to reflect the digital library environment and to provide longitudinal capabilities. Technology acceptance research is theoretically based in many socio-cognitive traditions and research has been conducted based on the theory of reasoned action (Davis, 1986; Al-Ghatani & King, 1999; Fenech, 1998; Doll et. al., 1998), social cognitive theory (Compeau et. al., 1999), diffusion of innovations (Agarwal and Prasad, 1998) social presence theory and social influence (Karahanna & Straub 1999). Each of these threads approaches technology adoption from a different perspective, including, but not limited to, personal motivation, social influence, uncertainty reduction personal efficacy with the technology, as well as the technology's capacity to perform the task (Goodhue 1995; Dishaw & Strong 1999). This research has established a basis for studying an individual's reaction to the introduction of new technology from affective, cognitive, and behavioral perspectives.

Metamorphosis’ Digital Library Community Model (DLCM) is rooted in Davis’ Technology Acceptance Model whose constructs of usefulness and ease of use provide a solid basis for validity and reliability. However, the electronic environment is unique from most of the
technological contexts that have been studied in the past because it encourages bi-directional information communication. Metamorphosis defines bi-directional information communication as the direct exchange of information documents between two individuals using an electronic mediary such as a digital library. This creates connectivity for scattered populations that promotes unique behavioral and social phenomena that have not been addressed in previously discussed technology-oriented models. It also requires special skills of the participants, such as the ones pinpointed by the GSDI’s individual institutional projects. Metamorphosis addresses these issues with specially designed measures.

DLCM adds several external variables that were suggested in TAM (Davis et al. 1989) and included in later research. These variables are potentially well suited to the DL environment, and include system features, user characteristics, situational constraints, and interventions by "managers" (or in the case of academic e-documents professors and administrators). For DLCM, user characteristics fall into two categories: demographics (age, gender, program, degree) and technical knowledge (computer experience, computer use, document creation use). System variables are also in two categories. The first refers to the digital library concept and includes awareness, accessibility, image, and overall rating. The second refers to the on-site systems and would be represented by interfaces and, to some degree, the hardware available for use.

The GSDI evaluation plan is based on an interrupted time series design which allows analysis of the effects of the project over its three-year duration including a comparison to non-participant institutions. First, at the inception of the project, a baseline will be established by surveying attitudes, as well as knowledge and skills, at representative U.S. institutions including participant institutions. The evaluation will track changes at those institutions, and assess the effects of each type of intervention provided by the GSDI. The interrupted time series design will help control for maturation effects and sensitization and testing effects. The control for history effects will be impacted by the timing used in introducing the interventions. The preferred method of intervention in which the intervention is introduced simultaneously at all sites, would control history effects the most effectively, but this may be moderated by the timetable of product development. The GSDI interrupted time series design evaluation plan does have some limitations in that it does not allow for analysis of how an individual’s attitudes may change over time, or for non-comparability of the different institutions. In order to adjust for non-comparability of institutions, the control group of institutions will be matched as closely
as possible to the institutions at which interventions are enacted using key characteristics such as student population demographics and degree programs offered.

<table>
<thead>
<tr>
<th>Institutions</th>
<th>Data Collection</th>
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<tbody>
<tr>
<td>Intervention enacted</td>
<td>baseline</td>
</tr>
<tr>
<td>Control</td>
<td>Measure 1</td>
</tr>
</tbody>
</table>

To add a qualitative perspective three flights of focus groups will be conducted at each grant participating site. They will be scheduled at the baseline, intervention#2 and follow-up points. While this information will not be projectable to the general population it will in-depth insight at each of these points which will help provide texture to the quantitative results gathered with the time series evaluation.

Another limitation of the study is that it will be administered with an on-line questionnaire. While this could produce some technological bias, it is a necessary in order to coordinate the evaluation work cost-effectively. However, to reduce the effect of technological bias, the online questionnaire will be designed to be extremely easy to self administer.

To measure the success of Outcome #3, a quantitative assessment of the impact of this project will be obtained through distributed data collection by member universities as well as log analysis from server machines. Evaluation will occur at each project site, and, with their help, at no less than 10 other sites, so that the growth and evolution of the initiative is tracked and improved, with ongoing formative and iterative refinement of project materials.

**TIER TWO EVALUATION**

Tier Two evaluation focuses on site specific project development.

**UK Focus: Metadata**

**The Problem**

The advent of digital libraries and archives is changing the face of scholarly communication and creating new avenues of knowledge dissemination. Scholars can be document consumers who access information from the electronic resources and they can also be document creators who author information that will be included in these resources.
The electronic resource community recognizes that the increase in scholarly e-documents will require document creators to also self-archive, or post their own work to, selected digital libraries and archives. However, a work will not be valuable to others unless it can be identified and retrieved. Therefore, the document creator needs special training to properly self-archive the work and assure that it can be discovered by others. Graduate students who are not familiar with the conceptual foundations of information storage and retrieval would have difficulty accurately self-archiving their works.

Teaching students about the fundamentals of information storage and retrieval would have dual benefits:

1. It would enhance the research skill of students at both the graduate and undergraduate levels since their increased understanding of how information was stored and organized would allow them to create more effective search strategies.
2. It would help graduate students understand what they need to do to effectively self-archive their theses and dissertations.

Whether information is collocated as full-text or surrogate records, the ability to easily discover and recover the information is a primary concern. To do this, the information system must be able to identify the existence of pertinent documents, provide access points to the documents, produce a list of the relevant documents, and provide a means of locating the chosen documents.

Access points can machine or intellectually generated. Machine generated indexes generally rely on keywords extracted from the document. While they can be very useful in tightly defined technical field they are less constructive as the database grows and the scope of topics increase. They are also less effective in dealing with multidisciplinary and interdisciplinary subject. Furthermore, they also require the searcher to be very skilled in defining the terms of the search. Intellectually generated indexes require a person to use disciplined judgement in applying pre-existing terms from controlled vocabularies. Intellectually assigned subject terms are carefully chosen to reflect the content of the document. Whether an index is based on a subject heading, descriptor or index string, it helps the searcher recover information by logically grouping information into a finite number of access points.

Metadata recorded in surrogates such as catalog records or Dublin Core allow for very effective searches. Metadata, which can be thought of as structured data about data, enable useful searching capabilities including fielded searches (i.e., searching by specifying specific fields such as author, title, language, etc.). It also provides a fundamental mechanism that increases the possibilities of interoperability between databases, and facilitates the use of powerful tools such as federated searches.

Project Activities
The University of Kentucky proposes designing a two-part self-administered online tutorial that acquaints students with the fundamentals of information storage and retrieval, introduces the concept of metadata and guides the graduate student to create a metadata record for the thesis or dissertation that is being self-archived. Each tutorial module would be designed to take approximately 20 minutes to complete.

Part 1: Finding Knowledge
This module would focus on the following topics:
What is information storage and retrieval?
How do we find what we are looking for?
Metadata: an introduction
What is metadata?
  The purpose of using metadata
  Brief overview of how document encoding schemes affect storage and retrieval

Part 2: Storing Knowledge
  This module would focus on the following topics:
  Introduction to metadata schemes such as DC, EAD, GILS, GIS
  How the document creator should determine what metadata scheme to use
  Semantic tagging: How to choose appropriate metadata for your document.
  NDLTD metadata guidelines
  Creating an NDLTD metadata record

Schedule

Year One: Material Gathering, Instructional Design
  The content and other aspects of instructional design for the tutorial modules will be created under the direction of Dr. Lois Mai Chan.

Year Two: Module production, Pre-testing on-site
  The modules will be produced to Dr. Chan's instructional design specifications. Prototypes of the modules will be pre-tested with graduate and undergraduate students at the University of Kentucky to determine the effectiveness of the design by measuring comprehension and ease-of-use. Modifications will be made as needed to create a better product. UK team members will disseminate preliminary results at appropriate academic conferences.

Year Three: Module dissemination, Evaluative testing
  The modules will be disseminated to partner institutions for use with their students. Evaluation will continue to determine how modules may be improved. By the end of this year, the modules will be available to other institutions. UK team members will disseminate final results at appropriate conferences.
C. Submission from Caltech (note that budget at end was submitted after the earlier part)

Caltech Component of the Proposal:
Preparation Scholars: The Graduate Student Development Initiative and the Open Archives Initiative

Prepared by Kimberly Douglas

Title: Open access to the scholarly record for the next generation of scholars

Caltech will take the lead role in preparing materials that express the value system that underlies intellectual property issues for the scholar. Through network technology, students will be exposed to relevant analyses and opinions covering research practices and behaviors that lead to progress in scientific discovery. This information will articulate the core value of common property ownership of research results in the interests of scientific enquiry. Students and new faculty will be encouraged to embrace their role and responsibility as scholars by ensuring continued open access to their work.

Specifically, Caltech will prepare a web-based, interactive self-edification site of compelling materials that alert and educate the new scholar to the historical base of sharing research results and informs her of possible actions regarding intellectual property management that consciously comply with the community property concept. Key topics will include responsibility of scholars to each other and to society; impact of access on the scholarly record, legal issues surrounding current copyright practices, and the alternatives that the Open Archives Initiative and the NDLTD provide.

The web-site design will follow a narrative structure built around filmed interviews of Caltech professors. They will describe their experiences conducting research; will highlight the evolution of their successful careers as it relates to unhindered access to the earlier research record. They will explain how they discovered the unexpected limitations on access to the scholarly record that the current legal environment has created despite the possibilities of the digital network and what they have done about it. The Caltech faculty is among the most successful and productive group of researchers in the world. Their own behaviors and stories, captured through filmed interviews, will serve as concrete manifestations of the core value system. This content will be used to illustrate, document and personalize the story of open access in scholarly enquiry. Caltech librarians will enrich the site by selecting and using research materials, policy reports, and documented effects of the current copyright law to augment the real-life stories of active researchers. Alternative publishing mechanisms of the Open Archives Initiative and the NDLTD will be included to illustrate constructive options.

A short, 30min. documentary style stimulation or trigger piece will be extracted from the website to package in an easily portable format (VHS, DVD) for the participating schools. Each school will duplicate and distribute the piece to relevant units on campus for use in instructional or guidance sessions. This synopsis vehicle will guide students to the more inclusive website.
Traffic on the website will be tracked as part of the evaluation process per procedures established by the University of Kentucky team. Students will be prepared for the ongoing revolution in scholarly publishing, and understand and support the Open Archives Initiative that promotes greater sharing.

Evaluation:
Caltech will conduct initial and continuous evaluation of the suitability and effectiveness of the website design and accessibility.

Caltech will be the initial test site for usability, continued interest and satisfaction among graduate students. Data will be collected as a result of voluntary responses via a web form. Caltech will participate in the formal evaluation to be managed by the University of Kentucky team.

In addition, Caltech will provide usage statistics of the web site, to track use and impact of presentation and educational efforts at the target campuses.

Year One

Planning, Material gathering, Design and Prototype Production:

The interactive web site will be planned out both in terms of content, presentation and accessibility. The various types of media will be defined and the technical deployment schema laid out. Production templates for various levels of format compression will be generated to support a variety of browsers and platforms. Documents, reports, papers will be gathered and permissions gained for adding to the web site as desired. A threaded model prototype of the website will be mocked-up and used for initial testing. Professor Rick Flagan will provide executive oversight of the project. Under the direction of Kimberly Douglas, reference librarians will be responsible for content and design. Staff of the Digital Media Center (DMC) will consult on design and will be responsible for encoding, technical editing, assembly and deployment.

Budget:

Equipment, 40 Gb capture drive, storage, array and media discs, Cd and DVD and DV cam tape will all be purchase in the first year. Contractor fees of the Digital Media Center billed at $30/hr. will cover the effort of encoding, technical editing, assembly and deployment preparation for the various media elements. Travel for two to coordination meetings. The Institutional commitment is reflected in staff time for the intellectual and creative work.

Year Two

Product generation:
The plan and prototype will be marketed to the faculty to solicit interest and involvement. Faculty identified in the process will be filmed as they explain and tell of their experiences. The interviews will be edited for inserting into the web site design. From the completed web site a selection of the elements, interviews, quotes, background material will be packaged into a 30 minute stimulation or trigger piece. Each school will receive a master of this piece in a format appropriate to their community so that it can be easily distributed to classes, programs and individuals. In this manner, the broadest community will be directed to the website. Data will be gathered from the website and there will be a web evaluation form available on a voluntary basis for users. Rick Flagan and librarians will finalize edited portions of the interviews. The DMC will process the elements into the website. Filming will be conducted by Mark Woods, Cinematographer.

Budget:

Equipment for filming 10 interviews will be rented: DV camera, lighting and audio kit. The cinematographer will be paid a minimal honorarium. The Digital Media Center fees of $30/hr. for final assembly and deployment. The staff time to conduct the interviews and finalize the product is slightly more than during the first year.

Year Three

Evaluation and refinement:

Caltech will provide continuous monitoring on the use of the website to meet the structure that the instruments of the University of Kentucky evaluation team will specify. The Caltech team will monitor the evaluative feedback on the usability of the website and make refinements as necessary in order to promote the service to more universities. Content and design will be upgraded as new materials and technologies become available and can be supported.

Budget:

The travel budget is increased to support necessary travel to coordinate expanding the program to other universities and to complete the evaluation phase. The duplication of product and survey instruments also needs to be supported.

Qualifications of the Caltech Team

The Caltech Administration, Faculty and Library System have demonstrated a committed interest to alternatives in scholarly communication. The Provost hosted one of the ground-breaking conferences on the topic in March 1997; The Library Administrative team, Anne Buck, the University Librarian, Kimberly Douglas, Director of the Sherman Fairchild Library, and Eric
Van de Velde, Director of Library Information Technology worked with Professor Bruce Murray on a campus-wide interactive web-based discourse on the issue of copyright of scholarly articles. Anne Buck’s and Professor Rick Flagan’s proposal entitled the Scholars Forum has generated inquiries and interest. Professor Rick Flagan was invited to present a paper on alternatives to current publishing patterns to the Association of Society Presidents in May 2000. All participants have a publishing record. The Caltech Library System’s web page design has been recognized as a model example of clarity and usability. The Digital Media Center is well-experienced in preparing media for deployment over the global network. Aside from preparing many multi-media presentations for faculty on campus, the DMC participates in broadcast-quality program development using the latest technology including streaming-video of President Clinton’s research funding speech at Caltech in January 2000. Mark Woods is a recognized cinematographer who consults with Kodak and is the technical writer for the journal, *International Photographer*.
Department of Education.  FIPSE Program

Final Budget Summary - Caltech

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<td>2. Employee Benefits</td>
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<tr>
<td>7. Other (Equipment Rental, Printing, etc.)</td>
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Note: $3,519 in the 3rd year is for undergraduate student wages only.
D. Submission from USF

**USF Focus: Tools and Training Materials for Academic Authors and Mentors**

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**The Problem**

1. Much of the functionality needed to support graduate education is already available in the commercial software market, but these computer tools are current underutilized. Many commercial software applications developed for business and commercial use have capabilities that could be directly applicable to problems faced by students during their graduate careers. However, the complexity of these packages is often daunting; indeed many of their most valuable features are buried beneath others that are largely irrelevant to research and writing processes. While students and faculty have many cutting edge tools to choose from, the burden falls to users to find, access, integrate, and learn from these tools. Surprisingly, even at major technical universities, such as MIT, faculty and graduate resistance to electronic scholarship has been a stumbling block. The biggest obstacle to implementing electronic theses and dissertations tend to be “human engineering factors” including students’, staffs’, and faculty members’ computer illiteracy. The need for such training at the faculty level and graduate student level is well documented. After completing his most recent annual survey of computer use on university campuses, Kenneth Green, Director Campus Computing Project, recently concluded "I think it's fair to say that many faculty members have ceded to their students the whole issue of technology skills," (Chronicle of Higher Education 10/29/99).

2. The 100 Year Question: Today’s students, faculty, and librarians are unsure about which files created by which tools will be archivable and accessible to future generations.

3. Poor student writing. Faculty and administrators who resist electronic scholarship often point to poor document quality as yet another reason to limit access. Debacles such as the Alan Sokol event and critiques in the popular press amplify the need for academics to write clearly. Students with ESL backgrounds, who constitute an increasingly large percentage of our graduate students, especially need additional assistance with advanced academic writing.

4. Students working on theses or dissertations, often the leaders in research and scholarship, face problems in completing those documents in a way that prepares them for the demands of their future careers. Lacking writing skills and lacking social supports for writing, nearly half never finish and end up ABD.

5. The major written works of most graduate students—e.g., theses or dissertations prepared in paper form—are rarely read, which is a serious disincentive for improving writing
skills. In contrast to the one or two interlibrary requests for theses and dissertations, the mean number of readers in VT’s collection is 500.

6. Without our leadership, universities are likely to define disparate and conflicting ideas about authoring platforms and archiving standards.

7. The NDLTD has made major progress thanks to past FIPSE funding. Without additional support, we will lack the resources necessary to continue our work.

8. Include a statement about CalTech’s work and its significance.

USF Project Activities

1. Based on the timeline of the milestones students and faculty face as writers, we will develop just-in-time educational resources to support students’ needs as writers and faculty members’ needs as mentors. We will develop a writing environment and training materials to help faculty and students find their voices as researchers and scholars, improve their writing and the likelihood that they complete their research and writing in a timely fashion, and effectively use the advanced features of available software to create an effective theses and dissertation. Throughout our work, we will ensure that our materials reveal their benefits to users. We will account for different learning styles and time commitments by developing a continuum of training options, including a Web site; a distance learning version; and a CD-ROM version of the training.

2. We will develop templates, wizards, and macros—that is, tools that facilitate e-writing. By software tools, we mean both technology to support specific activities such as data analysis and software that manages the processes of graduate education.

Note: Appendix A provides a tentative outline of our Training Manual, Wizards and Templates

Expected Benefits

Students will appreciate our training materials and toolset because the environment will show them how to accomplish their writing, research, and publishing goals. Our materials will encourage students and faculty to write regularly, understand rhetorical principles and readability guidelines, and think beyond the straight jacket of the traditional print thesis. The communications capabilities of the tools will facilitate the development of multiple levels of support groups: fellow students, the student's committee and major professor, students from elsewhere in the university or from other locations, and faculty from outside of the student's home institution. Past research has demonstrated that support for research and regular writing helps graduate students complete their work in a timely and professional manner.

Faculty will support and appreciate the training materials and toolset because less time would be spent in individually tutoring students. Each student would develop a bibliography reflecting his work, and a collective bibliography would emerge encompassing all of a faculty member's advisees. A student's acquired expertise will not completely leave with that student but will remain to help bootstrap new students (and new interests of the faculty member). Finally, because these tools emphasize interactions and networking, the efforts of students working with
a faculty member would be known to a wider audience. Similarly, their final electronic theses would also be much more accessible. This would provide publicity and enhanced visibility for the student and that student's lab and major professor.

**Evaluation**

USF will conduct initial and continuous evaluation of the suitability and effectiveness of the writing environment and training materials. Our evaluation will identify deficiencies in the quality of the specific tutorials as well as missing components. We will test these materials with the 20 graduate students involved in our NewMediaWriting research project, with 60 students in our graduate courses sponsored by the Colleges of Arts and Sciences, Business, Engineering, and Medicine. Participants will be asked to evaluate specific components of the training materials as they use them. In addition, participants will provide an overall evaluation near the end of this development period. USF will provide continuous monitoring on the use of the website to meet the structure that the instruments of the University of Kentucky evaluation team will specify. The USF team will monitor the evaluative feedback on the usability of the website and make refinements as necessary in order to promote the service to more universities. Content and design will be upgraded as new materials and technologies become available and can be supported. Data will be collected as a result of voluntary responses via a web form. USF will participate in the formal evaluation to be managed by the University of Kentucky team. USF will provide usage statistics of the web site, to track use and impact of presentation and educational efforts at the target campuses.

**Budget & Schedule**

**Year 1, Planning, Material gathering, Design and Prototype Production**

The Institutional commitment is reflected in faculty members’ time for the intellectual and creative work. Participating faculty are eager to commit a significant part of their creative time, expecting this project to facilitate electronic theses and dissertations at USF and other universities. Also, the university will provide a computer classroom, support from Instructional Technologies to develop a high-end Flash website, a Microsoft Theater Server, two Exchange Servers, Winnov multimedia cameras, and computer equipment. From FIPSE, we seek funds to pay for one research assistant, and contractor fees to pay for the encoding, technical editing, assembly and deployment preparation for the various media elements, including for example, videos of our successful graduate students and faculty’s efforts at creating multimedia theses and dissertations. One digital camcorder will be purchased. Software tools for writers will be purchased as needed. Travel for two to coordination meetings.

**Year 2, Deployment of Training Materials**

Year two reflects the same institutional commitment, use of faculty members’ creative time, software assessment, and travel. In year two we will use the University of Kentucky’s and our assessment information to refine the training tools, reference materials, and software tools. In year 2, we expect to extend our timeline of the milestones graduate students’ face as writers, particularly in the areas of visual rhetoric, tool development, and navigational principles for hypertextual writing. However, in year 2, we expect to focus more on developing resources for
faculty and administrators so that they understand the value of the resources we develop in year 1 for students.

**Year 3, Evaluation and Refinement**

We will use our training materials, tools and reference materials at the other four participants’ campuses. Evaluation of our resource environment will continue. Project members will disseminate project results at appropriate academic conferences. The travel budget is increased to support necessary travel to coordinate expanding the program to other universities and to complete the evaluation phase. The duplication of product and survey instruments also needs to be supported.

**Qualifications of the USF Team**

Passionate about the value of multimedia scholarship, the effective use of existing tools, and digital libraries, the USF team has been working collaboratively for the past two years. In that time, we have secured limited support from Microsoft, Dell, and Adobe. As a result, we have ten networked computers that are loaded with the tools graduate students need to create ETDs, including all of Microsoft’s and Adobe’s tools and some of Macromedia’s. Presently, we are working with a team of 20 interdisciplinary faculty and students. With hopes of inspiring graduate students at USF, we are working to develop exemplary ETDs.

In the past, we have held workshops for graduate students and faculty, and sponsored an international symposium on electronic theses and dissertations that was attended by 225 attendees, representing 13 countries and 35 states ([http://etd.eng.usf.edu/conference](http://etd.eng.usf.edu/conference)). Team members have presented their work at international conferences, coauthored essays, and met biweekly for one and a half years. Joe Moxley has edited or authored nine books on academic writing. Bruce Cochrane is Professor of Biology and Director of Interdisciplinary Studies. Rosann Collins directs the Business College’s graduate program on mentoring and research methodologies. Anita Callahan, an Associate Professor of Engineering, is a pioneer in distance education, associate chair for industrial engineering, and graduate program director. Terry Beavers leads USF’s instructional assessment initiative. Ilene Frank and Monica Metz-Wiseman direct the university’s virtual library initiative. Mike Salmond teaches classes in multimedia authoring and Flash for IT.
Appendix A, USF Team’s Outline of Training Materials

Graduate Student Resource Environment (Draft)

Introduction
• Why Create an ETD? (Moxley)
• What is the NDLTD? (Moxley)
• Case Studies of Notable ETDs: Science, Engineering, Business (Moxley, Callahan, Collins, Cochrane)

Administrative Issues
• Campus Leadership, Partnering & Interdisciplinarity
• What training does your campus need to provide to network administrators, faculty, and graduate students? (Beavers)
• What can you tell Systems Administrators to Get Their Support? (Beavers)

Prewriting
• Scholarship as a conversation: listservs, conferences, websites, publications (Moxley)
• Maintain a Writing and Research Notebook (Moxley)
• Connect coursework with research (Moxley)
• Develop a research question, a theses or dissertation proposal (Moxley)
• Remote Realtime Collaboration (Beavers)
• Annotated Bibliography Toolsets: Overview of Proprietary Software Tools (Frank and Collins)

Collaborating
• Using Word’s commenting, inline editing, versions, and tracking features (Moxley)
• Using Internet Explorer’s Discussion features (Moxley)
• Using Front Page to create discussion forums (Moxley)
• Real-time collaboration and discussions (Beavers)
• Netmeeting and web discussions (Beavers)

Information Management
• Using Outlook to manage your information
• Using Word’s Outlining Tool

Writing
• Which Tool Works Best for Your Thesis or Dissertation? An overview of authoring tools and reference help, including Word, FrontPage, Access, Excel, Adobe PDF (Moxley)
• Multimedia Video: PowerPoint and Word (Callahan)
• Multimedia Video: Streaming Multimedia: Netshow (Beavers)
• PowerPoint: Academic Writing and Publishing (Moxley)
• Graphics 101 and Visual Rhetoric (TBA)
Choose a Methodology

- Overview of Research Methodologies

Acquiring and Interpreting Data

Students, especially in the sciences, are often required to gather and organize data from a variety of disparate sources. For example, a field biologist may have data gathered in the field—observations, geographic and physical data—that needs to be integrated with genetic, physiological and morphological data gathered in the field. We will use existing applications—database management tools and Web database access software—to develop fully customizable systems that can be adapted to the needs of a particular project. By taking a web-based approach, we can incorporate the flexibility to include real-time entry of field data, any time any place access to data, and sharing of data with collaborators, and mentors.

- Search Engines, Boolean Searches, and Intelligent Agents (Frank)
- Collection and Analysis of Qualitative Data (Collins)
- Collection and Analysis of Quantitative Data (Collins)
- Using Pivot Tables and other Office 2000 tools to Promote Reader Interaction (Cochrane)
- Using Access for Compiling and Analyzing Field Data (Cochrane)
- Using GPS with Office 2000 (Cochrane)

Data Integration

A cost of the creativity that drives today’s software industry is that independently developed applications can often be difficult to integrate. An example that we will focus on is Geographical Information Systems (GIS). For the professional geographer, the industry standard (ArcView/ArcInfo, ESRI, Inc.) provides enormous power, but the complexity of these packages are a barrier to the more casual user. Furthermore, it can be difficult to integrate data from other applications (for example Microsoft Access) with GIS-generated datasets.

To address these problems, we will explore how the evolving capabilities of GIS can be exploited in a straightforward fashion to accomplish two broad goals. First, we will identify those tools that allow a student to easily post map data generated with GIS to the web in an interactive fashion. In so doing, our objective will be to design systems that obviate the need for any programming on the part of the student. Second, we will determine how best data contained in other sources can be incorporated into such a published GIS project. For example, using the example of the field biologist again, we envision her being able to easily publish a GIS-generated map on the web, which contains links to whatever data have been gathered from whatever source at sampling locations included in the map.
Data Sharing and Collaboration
As graduate education becomes more interdisciplinary and global in scope, students will find themselves needing to avail themselves of feedback from experts in a broad variety of fields and from a wide assortment of institutions. The Web provides the obvious infrastructure for facilitating this, and modern office productivity suites (Office 2000, Star Office 5.1) include many tools that facilitate web-based collaboration. We will develop wizards that will help students address the following questions:

- What data needs to be shared?
- In what form should it be shared?
- With whom should it be shared? More specifically
  - Establishing security permissions should be straightforward
  - Within the group involved in a particular project, access for each individual involved should be easy and tailored to his or her role in the project
  - The degree to which an individual can work interactively with data should be set according to the particular role of that person.
- How can these data best be incorporated into an ETD?

Finally, having developed the means whereby students can organize their own collaborative systems, we will provide targeted information as to how data collected in such applications as spreadsheets and databases can be most effectively published to the Web for sharing with contributors and collaborators.

Reference Management
- Creating an annotated bibliography
- Citation Tools
  1. Word to Bibliocite (Metz-Wiseman)
  2. Word to Endnote (Frank)

References

Index

Extended Contents for CD ROM
The CD will provide an online version of the printed text. In addition, it will include samples, illustrations, macros, and tutorials.

Wizards
- The structure wizard.
  1. The structure wizard creates a research proposal, a thesis, and dissertation. For longer documents, it would have a document planner for each chapter as well as the whole. (Moxley and Beavers)
- The bibliography wizard.
  2. The bibliography wizard would enable students to enter key bibliographical information, a summary, a paraphrase, or a direct quote. Students would benefit from this wizard because it would help them integrate fieldwork, research, and scholarship in their disciplines.
- The daily writing wizard (Moxley, Collins, and Beavers)
  3. The daily writing wizard would work within Outlook.

**Macros**
- The formatting macro streamlines the USF graduate school's formatting conventions and requirements. This enables students to apply a template to their content, thereby saving them time. This template will provide a sample that other universities can adopt. (Collins)
- The glossary macro creates glossaries on the fly. (Sullivan)
- This index macro improves on Word's indexing feature, making it easier to index multiple documents. (Sullivan)
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