PETTT
Program for Educational
Transformation through Technology

Reader's Guide

This report documents the activities and accomplishments of PETTT during its second year of funding. Because the report contains a great deal of information, we have provided this reader's guide to help readers identify important sections. Additionally, this reader's guide can aid in navigating between the main report and supplemental appendices.

Main Report: The main report contains a five page executive summary of our activities and accomplishments. This executive summary represents the combined efforts of our team.

Progress Report Appendices: Each main activity mentioned in the executive summary has an associated progress report appendix in the supplemental appendices. The progress reports have a uniform structure. Each report begins with a short statement about what the project is about, why the project is important, and PETTT's role. Next is an explicit description of how the project relates to one or more of three PETTT goals. The subsequent sections include background, activities to date, current directions, impacts, and contributors.

The progress report appendices represent the individual voices of the members of our team. Some have been written by high level staff and others have been written by graduate students. While these document do detail our accomplishments for the past year, there is also a living quality to the documents. As we conduct our activities, our understanding of these projects evolves.

Operations Appendices: This set of appendices contains information about (a) how we run our organization, (b) our financial situation, and (c) our team.

Impact Appendices: This set of appendices aggregates information about our impacts via papers, proposals, and campus impacts.

We hope that this collection of information provides a relevant background for anyone wishing to learn more about PETTT.

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Appendix A-1. PETTT Approach

Mission Statement

PETTT is a multidisciplinary UIF-funded initiative at the University of Washington that explores the interplay of technology and pedagogy in real settings. Our goal is to facilitate thoughtful and innovative educational technology uses, through our research, development, and collaborative service activities. PETTT makes strong connections between research, design, and practice in order to bring the science of learning to teaching with technology.

Description

The Program for Educational Transformation Through Technology (PETTT) explores the interplay of technology and pedagogy in real settings with the goal of facilitating thoughtful and innovative educational technology uses. In order to achieve our goals, PETTT must enable networks of scholarship to grow where they might not otherwise and build enduring collaborative relationships around the real experiences of those uses. Building collaborative relationships with and among members of the UW community is essential to ensure that our work is forward-thinking, responsive to the needs of our community, and contributes to a culture of thoughtful exploration of educational technology.

Phases of PETTT Involvement

PETTT first must know about as many applications of educational technology at the UW as possible. We must also determine what ideas instructors have for teaching with technology, but have been unable or unwilling to implement and their reasons why. These questions are at the forefront of the first phase of PETTT's involvement: groundwork. The information-gathering that takes place in the Groundwork Phase begins a four-phase process of increasing complexity and resource commitment over time.

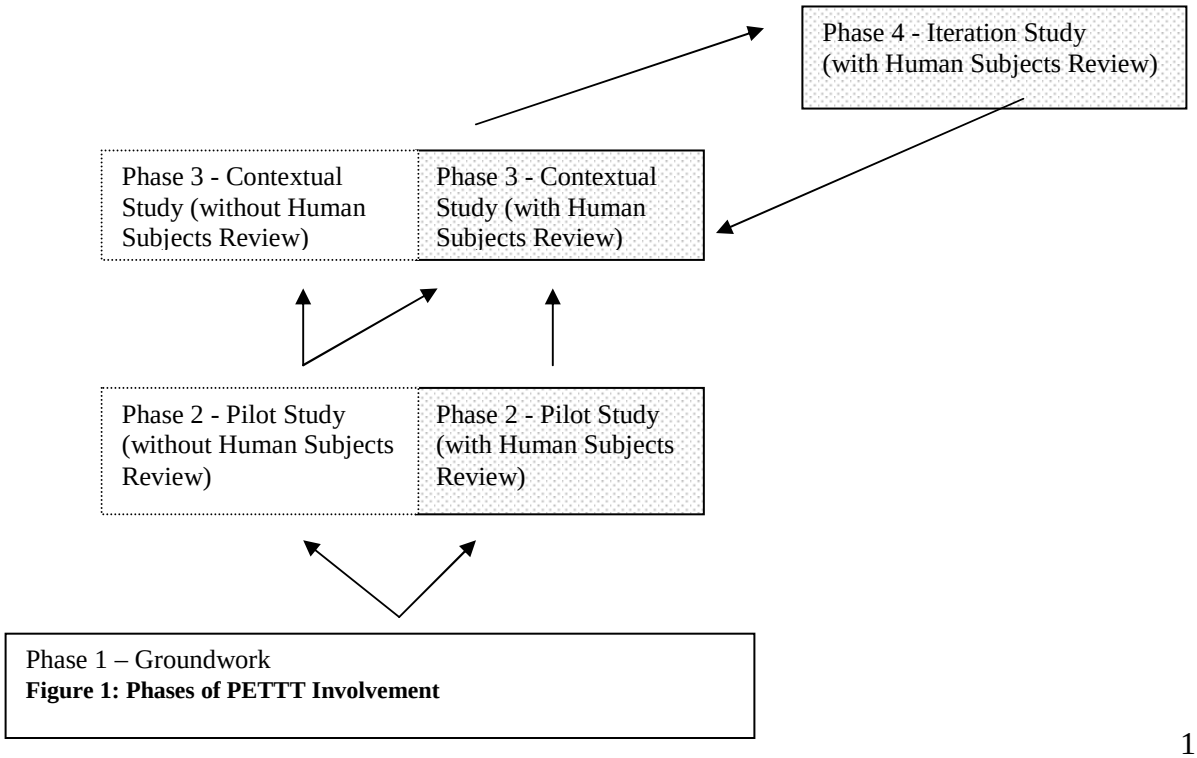

Figure 1: Phases of PETTT Involvement

Phase 1 - Groundwork

In this phase, our work emphasizes exploratory conversations and investigative, non-experimental activities: information gathering, project characterization, needs assessment, and network brokering. The data and partnerships resulting from groundwork shape the research questions and focus areas PETTT will pursue and establish PETTT as a common contact between UW educational technology innovators. Depending on the needs of the project partners and appropriate review by the Human Subjects Division, subsequent work follows one of two tracks: Program Evaluation (without Human Subjects Review) or Applied Research (with Human Subjects Review).

Phase 2 - Pilot Study

When our discoveries in groundwork align with PETTT's goals and we have partners interested in finding out more, together we may progress to the next phase of work, the pilot study. Pilot studies afford us a closer look at what takes place in the project environment, or a close approximation of that environment, in order to develop informed hypotheses, offer recommendations, and in some cases hone research questions for subsequent research. Pilot studies also help us decide whether or not it is beneficial for both partners and our service community to pursue more in-depth research.

Phase 3 - Contextual Study

The next step is to make a full study in context of the actual educational environment, guided by our foundational groundwork and pilot study data. Research questions and methodologies in hand, the PETTT Team joins with its project partners in designing and establishing experimental conditions, gathering and treating data, debriefing the study experience, and reporting findings. PETTT makes additional recommendations for re-design, based on the most current data from research in the real setting, to the project partners.

Phase 4 - Adaptation Study

The adaptation study is a phase of work that makes PETTT unique. In this phase, the project partner has refined the design of an educational environment, based on findings from the previous PETTT contextual study. PETTT then continues to work with the partner to pose additional research questions that take advantage of the design iteration and disseminate our findings to the UW community. In this way, PETTT and the project partner enable an even richer understanding of the educational environment and offer our service community a constant stream of current, relevant, local research on innovative applications of educational technologies. Adaptation studies are Applied Research and therefore require Human Subjects Review.

In practice, these phases of work may involve several concurrent cycles of iterative design and research. At various points in the process, we may pause to perform a variety of "spin-off" activities. We may document the elements of the project and its uses, and provide a description of its implementation to other faculty. We may develop tools and guides for dissemination to the faculty at large. In order to help faculty use these tools for different pedagogical purposes, we may highlight possible differences in approach that become apparent as different faculty make use of these resources in different contexts. We may also present the results of our investigations at local and national meetings and in scholarly publications.

Development and Dissemination

PETTT's goal of catalyzing the transformation of education through the effective use of technology cannot be accomplished solely through research; ultimately such transformation will occur through the efforts of UW educators. Thus, another key element of our overall framework is a focus on dissemination of processes, tools, and ideas. In order to facilitate the dissemination process, we have created opportunities for educators to learn to innovate both by using PETTT resources, and by learning about one another's experiences as colleagues, as peers, and as a community of lifelong teachers and learners.

We have chosen to disseminate knowledge about educational technologies via a variety of avenues so that we can reach as many educators as possible. To date, we have identified six dissemination strategies. The first three follow from our research efforts and are focused on ensuring that we conduct "research that matters" (Sabelli, 2000). The remaining three strategies complement all PETTT research and service efforts.

1. Improve the project: PETTT can disseminate knowledge by using research results to improve and refine the projects themselves. Each iteration of a project design embodies (disseminates) the lessons that we have learned from the previous iteration.
2. Add tools, techniques, and ideas to the 'educator's toolbox': As we progress through the research process with a project partner, we strive to translate what is learned into guides and tools are of broad use to UW faculty. We work closely with the UW's Catalyst initiative to develop and disseminate these guides and tools.
3. Publish and present in scholarly communities. Since PETTT is a university-based research endeavor, it is important that we participate in scholarly dialogue and contribute to the creation of new knowledge our research area. Thus, we also disseminate the knowledge that we develop through traditional avenues of scholarly publications and presentations.
4. Make our process visible: While the preceding dissemination efforts focus on us disseminating the results of our research, we also believe that the process by which we work with project partners has educational value. We make our own process visible through avenues such as public presentations and the PETTT Web site so that others can learn from our process.
5. Create and nurture communities on the UW campus: UW faculty often learn about educational technology efforts from one another, and PETTT stimulates and supports that learning by creating and fostering communities on the UW campus in which dissemination of knowledge can take place.
6. Bring lessons learned to new domains: A final form of dissemination is to translate lessons learned in one domain into new domains through strategic selection of projects, generalizing findings, and bringing the process full circle.

Ongoing Evaluation

The final element of our overall PETTT framework is a commitment to continuous evaluation comparing the functioning and outcomes of our program to our stated objectives. Such an evaluation provides a broad overview with two goals: first, to provide program leadership with regular feedback regarding the conduct and direction of the program; and second, to inform both program leadership and the University community about PETTT success in achieving its mission.

Appendix A-2. Exploratory Collaborations

Description

Exploratory collaborations are the first steps PETTT takes in serving the University of Washington. These relationships are formed in the groundwork phase of PETTT activities and consist of discovery conversations and investigative, non-experimental activities, including: *information gathering, project characterization, needs assessment, and network brokering*.

Through exploratory collaborations, PETTT is able to be deliberate and mindful with our goals and the goals of our project partners, all the while making strong connections between research, design, and practice. Exploratory collaborations serve our goals in several ways:

- **Explore the interplay of technology and pedagogy in real settings:** Strategic selection of projects gives PETTT the opportunity to develop a directly informed perspective of project partners' technology uses, fold that insight into our other work, and report our findings to the community at large.
- **Facilitate thoughtful and innovative educational technology uses:** Early feedback given by PETTT to project partners concretizes the collaborating partner's conception of their technology use, brings focus to their project objectives, and situates their experiences in the context of relevant literature and local data.
- **Make strong connections between research, design, and practice:** Data and partnerships resulting from exploratory collaborations shape the research questions and focus areas PETTT will pursue and establish PETTT as a common contact between UW educational technology innovators.

Background

Exploratory collaborations are PETTT's way of reaching out to its service community in order to listen to how teachers and learners experience educational technologies in real settings. PETTT makes special efforts to seek out innovative uses of numerous, varied technologies throughout the broad spectrum of academic disciplines, and we regularly meet to discuss how our research findings will have an impact both to the specific disciplines of our project partners and to educational technology use in general.

Specific Activities

Each project listed in Table 1 has helped to shape our understanding of some dimension of variation in educational technology use. For many of our partners these exploratory collaborations alone sparked new ideas for networking with colleagues or re-ignited the passion of limitless possibility for pedagogical self-improvement.

	Partner	Project
Information Gathering	Department of Computer Science & Engineering	Participatory design; re-designing large lecture courses with Tutored Video Instruction; direct-instruction video artifacts
	Center for Ecogenetics and Environmental Health	Inquiry-based learning; videoconferencing between K-20 networked schools
	Center for Environment, Education, and Design Studies	Multi-media project documenting a community-service learning project
	John Wilkerson, Political Science	LEGSIM: Legislative Simulation
	Richard Karpen, School of Music	Video Traces, audio applications
Project Characterization	Department of Geography	Student self-reflection; formative assessment; Catalyst Portfolio Tool (in development)
	Daniel J. Evans School of Public Affairs	Case method; videoconferencing; technology-enhanced classroom design
	Office of Educational Partnerships & Learning Technologies; Community Arts Partnership; Computing & Communications	Tribal Arts Web-based archive; Video Traces and a virtual tribal arts museum
	Center for Statistics and the Social Sciences	Case method; adaptation of Catalyst VirtualCase Tool
Needs Assessment	School of Nursing	Web-Based Program to Improve Activity Adherence in OA; Needs assessment to determine how School of Nursing can make best use of streaming media
	Department of Electrical Engineering	Problem-based learning; Catalyst VirtualCase Tool
	Office of Educational Assessment	Faculty Survey on Instructional Technology Instructional technology use at UW; ongoing discussions of information literacy and transformative assessment
	Education at a Distance for Growth and Excellence (EDGE)	Mechanical Engineering 572; Re-designing televised lecture courses; complete use of Catalyst toolkit
	Freshman Interest Groups (FIGs)	Portfolio Tool explorations students developing portraits of themselves as learners
	Jaime Diaz, Psychology	MRAS (Microsoft Research Annotation System); Changing the Lecture Class Format

Network Brokering	College of Education	Life Cycle of a Teacher; PT3 Dept of Education Proposal; Web-based video case software: College of Ed, Computing & Communications, UWTV and various vendors
	Educational Technology Development Group	Promising Practices: Research-supported reports of promising teaching practices that use educational technologies; PETTT dissemination mechanism on Catalyst in development
	Dan Hunt, Associate Dean of Academic Affairs, School of Medicine	Linking International Faculty Expertise in Health Science: The Life Project
	Steven Tanimoto, Computer Science and Engineering	INFACT-Markup Tool: Facet-based assessment tool in development
	Digital Animation Lab	Design animation resource lab in OUGL being designed in collaboration with CSE for their interdisciplinary capstone design course
	eGroup: Patient-Centered Health Management Collaboration	The Diabetes Source: An Enduring, Enhanceable, and Scalable Web-Based Information Dissemination System
Other	Computing & Communications	UW Media Services development, http://Webmedia01.cac.washington.edu/
	Department of Orthopaedics	Video Traces, medical students learning suturing techniques; Log File Stat Tool: Web site log file analysis tool
	Educational Outreach	Learning styles pre-assessment tool
	Sara Kim, Family Medicine and College of Education	EDCI 505: Interactive presentation with education graduate students on emerging research methods currently being used by PETTT
	Law for Washington (Law School, Information School, OEP, Judge Marlin Appelwick, Council on Public Legal Education)	Gateway Legal Web site
	American Institute of Graphic Artists	Experience Design

Table 1: Groundwork Phase at PETTT's Second Year

Next Steps

Through our information-gathering and outreach efforts at UW and our knowledge about current directions in educational technology research, PETTT has identified a number of focal research areas: technology-mediated communication, educational video artifacts, Web-based educational

systems, and case-based teaching and learning. These strategic areas represent key issues in the research community, as well as areas that are of interest to a broad cross-section of the UW community of educators.

PETTT will continue to stimulate conversations and collaborations around those focal areas, while adding new areas that build on that existing work and respond to new directions in research and to the new projects and interests of UW educators. Areas of exploration involving educational technologies that we have identified for the coming year include:

- **Service/field learning** - enabling more students to participate in service and field learning, providing strategies to help learners realize the intellectual impacts of such experiences, and finding ways to assess the learning that results.
- **Large-enrollment course redesign** - redesigning what are often students' first university-level courses to increase the quantity and quality of student participation, maximize individualized instructor attention, and lower course costs.
- **Self-assessment and metacognition** -- helping students see connections among courses, work toward overall curricular outcomes, and develop their disciplinary and professional identities.
- **Information literacy** - working with libraries and units on standards-based curricula and the development of criteria and strategies for assessing fluency in information technology.
- **Departmental libraries** - creating infrastructure and exploring processes for developing and populating digital libraries of departmental teaching materials, while examining technology adoption and adaptation issues.

UW Community Involvement and Impacts

PETTT has consistently reached out across campus to bring together as many people, projects, and ideas as possible. Among core PETTT staff alone, nearly 3,000 service hours have been invested in the development of multidisciplinary networks, project collaborations, and ongoing conversations of educational technology use at the UW. We expect to continue extending these and other collaborative service activities as an integral part of PETTT's work in year three.

Appendix A-3 Arthritis Source

Description

The Arthritis Source is a Web-based information resource created to help self-motivated, geographically dispersed learners ("learners at large") gain access to information about arthritis. It was developed to support the needs of everyone who interacts with it: the users ("learners"), the site managers, and the content creators ("teachers"). The Arthritis Source represents an important genre of educational technology—a Web-based educational information system—as well as an effort to reach learners beyond traditional academic boundaries. In addition, the Arthritis Source relies on a unique content creation system, based on templates, that facilitates both learning and teaching. For the past two years, PETTT has used a science of learning framework to explore the development of an analysis process and content creation system that meets the needs of both learners and teachers using the Arthritis Source. Developed by PETTT, this process of creating, organizing, and maintaining useful information has the potential to be of service to many information domains on campus, including other medical services and courses with large amounts of information to provide to learners.

In working with the Arthritis Source, PETTT is focused on creating (and learning to create) Web-based educational information systems that have the following properties.

Learner-centered: We want to provide content addressing learners' information needs in a format that allows learners to find the information they want.

Process- and infrastructure-centered: We want to maintain a procedure and infrastructure for developing such content in a sustainable manner.

Evaluation-centered: We constantly monitor whether we are achieving our goals.

Our activities serve PETTT goals in several direct ways:

- **Explore the interplay of technology and pedagogy in real settings:** The Arthritis Source was created by a UW faculty member, Dr. Matsen of Orthopaedics, who had a strong desire to share information with learners outside the university's boundaries. PETTT has focused on exploring how to discover and meet the learning needs of learners-at-large, and how campus faculty members can most easily and effectively address these needs.
- **Facilitate thoughtful and innovative educational technology uses:** We are creating a system that supports our vision of a sustainable and scalable Web-based educational source that will allow other faculty members to share information in similar ways.
- **Make strong connections between research, design, and practice:** PETTT has developed the Arthritis Source in response to the results of our research about learners at large and the body of literature surrounding patient education. Now that the Source has been implemented, we are researching the effectiveness of its design and organization. Our iterative cycle of evaluation, design, and research helps us ensure that learners are successfully using the site and that the site changes in response to the learners' needs.

Background

Dr. Fredrick A. Matsen III, M.D., Chair of the UW Department of Orthopaedics and Sports Medicine, first developed the Arthritis Source in 1995 using brochures published by the Arthritis Foundation. PETTT has been working with the Arthritis Source since autumn 1999.

The Arthritis Source is one example of an important online education phenomenon— health information Web sites. Recent studies estimate that 60 million Americans regularly use the Web for health or medical information (Pew Internet & American Life Project, 2000). Some highly ranked health Web sites include: Allhealth.com, CBS Health Watch, Intelihealth, Onhealth, and WebMD. Interest in the roles and effectiveness of such Web sites has led to several recent studies of their effectiveness and quality (e.g., Hoffman-Goetz, 2000; Chen and Minkes, 2000). A recent RAND study (Berland et al. 2001) identified two amajor user complaints: (1) incomplete answers to important health questions, and (2) information overload. Our work on the Arthritis Source responds to these patient needs in this context.

Specific Activities

In our first year, we focused on two questions:

(a) How effective is the Arthritis Source?
(b) What are the important characteristics of the learners using the Source?

We explored various ways to address these two questions. One of our main goals was to design an effective educational site by profiling the learners who use the site.

During our second year, we have made significant steps in developing and studying the Arthritis Source. The two most important steps were the implementation of a site re-design based on our first-year research, and the development of an evaluation strategy that will "listen to the learners" in an effort to measure and explore the usability, learnability, and effectiveness of the new site.

Listening to the learners

We want to ensure that the Arthritis Source contains the type of information for which learners are looking. We use the phrase "listening to the learner" to describe our explorations of learners' needs. To understand the learners interacting with the Arthritis Source, we have employed a variety of "listening" mechanisms. Specifically, we have:

(a) conducted a content analysis of discussion on arthritis discussion boards;
(b) analyzed log files (Shelton and Turns, 1999);
(c) collected email correspondence from learners and patients;
(d) observed the questions asked at a public patient education forum;
(e) conducted a large-scale online survey (Turns & Liu 2001; Turns 2001);
(f) interviewed learners over the phone (Liu 2001); and
(g) explored how certain users adopt the Web site into their practice (Shelton 2001).

From these efforts, we have been able to:

(a) gain a better understanding of the demographics of our learners,
(b) collect over 1,300 questions asked by learners using the Arthritis Source,
(c) begin to understand the background knowledge and conceptions/misconceptions that learners bring to their inquiry activities with the Arthritis Source.

People Involved: Jennifer Turns, Tracey Wagner, Kristen Shuyler, Kristina Liu, Brett Shelton, Ralph Warren, Alice Tanada

Interface modifications, including question-driven navigation

A second emphasis in our second year has been on the interface and navigation of the Arthritis Source. We successfully released a new version of the site in July 2001, which featured a new interface and improved system architecture. A major change currently under development is the building of a question-driven navigation. When this question-driven navigation is functional, visitors looking for information in the Arthritis Source will be able to browse the site, use a keyword search, ***or*** ask a question in their own words. If they choose to ask a question, our system will interpret the question and identify similar questions that have already been processed and answers "certified" by one of the department's doctors (this is our effort to ensure the high quality of the medical information available on the site). These similar questions, and their "certified" answers, will be presented as search results to the user. The user can then do one of three things:

(1) recognize one of the questions as similar enough to their original question that they wish to read the answer,
(2) rephrase their question to get different search results, or
(3) submit their question to be added to the database of learners' unanswered questions. These unanswered questions will help drive the development of new content that addresses learners' needs.

This question-based navigation has grown out of our efforts to "listen to the learners." We have discovered that many people come to the Arthritis Source with particular questions that require complex combinations of information to answer. The question-based navigation system is an attempt to support learners as they search for answers in the way they are most naturally inclined—by asking questions in their own language.

The question-answering system consists of three parts, all independently upgradeable:

(1) Natural language processing (NLP). The current NLP is very basic but is becoming more sophisticated. Learners' questions are parsed into standardized text and processed by a dictionary of medical terminology, a spell-check, and a thesaurus.
(2) Semantic matching. The parsed user questions are compared to questions to which we already have "certified" answers. The system returns those questions (and answers) that are most similar to the original learner's question.

(3) Evaluation of the question-based navigation system and the content of the site through various analysis and management mechanisms built into the system.

People Involved: Aaron Louie, Kristen Shuyler, Scott Macklin, Ralph Warren, Rick Matsen

Development of template-based content

A third emphasis in our Arthritis Source work during our second year has been exploring the feasibility of distributed content creation using Web-based templates. In this context, a template refers to a pre-determined structure that guides and simplifies the process of writing learner-centered articles for the Arthritis Source. Our efforts to "listen to the learners" have guided the content and organization of the templates; we write the templates' questions in response to learners' needs. The templates index and structure the content of the articles, facilitating learners' searches and reading comprehension. During year 2, we developed two templates and piloted their use with a small set of authors. This effort will be a greater priority during year three.

People Involved: Tracey Wagner, Kristen Shuyler, Aaron Louie, Rick Matsen

Current Directions

Evaluation

One of our goals for our third year will be the development and execution of a formal evaluation plan for the Arthritis Source. This evaluation-centered research will focus on four questions:

(1) Are the new procedures and technologies on the Arthritis Source working?
(2) Do learners and users find them satisfactory?
(3) What does learning with the Arthritis Source look like? What is being learned?
(4) How are the new procedures and technologies adopted by the content creators and administrators?

People Involved: Tracey Wagner, Kristen Shuyler, Nana Lowell, Jennifer Turns

Template development

During year three, we will augment the content of the Arthritis Source by developing a full range of templates and using those templates to create more learner-centered articles.

People Involved: Aaron Louie, Kristen Shuyler, Scott Macklin, Rick Matsen

Expansion of architecture to other domains

Another goal for our third year is to work with other organizations on campus in an effort to share our architecture and methods as a basis for developing Web-based information systems in their areas. The first area will be patient education in the domain of diabetes. This opportunity will help us encounter and address new issues, including linking the patient education resource with databases of patient information.

People Involved: Scott Macklin, Rick Matsen, Aaron Louie, Kristen Shuyler

Overall Impacts

Statistics

- Approximately **2,500 learners a day** use the Arthritis Source.
- We worked with, studied, or contacted **1,984 learners** in our "listening to the learner" activities (including **1,351 e-mails** from learners in the past year).

PETTT Personnel

- Dr. Matsen
- Scott Macklin
- Jennifer Turns
- Aaron Louie
- Kristen Shuyler
- Tracey Wagner
- Kristina Liu
- Ralph Warren
- Brett Shelton
- Trevor Leffler
- Alice Tanada
- Rick Rose

Campus Organizations and Individuals

- Dr. Harold Goldberg and the diabetes group.
- Cezanne Garcia, manager of Patient and Family Education Services, UWMC: discussions about patient-centered article development.
- Computing and Communications: discussions about the adoption of our content management system, ZOPE.
- Jan Spyridakis, Professor, Technical Communication: discussions about possible inclusion in NIH proposal.
- Stuart Sutton, Associate Professor, Information School: discussions about the infrastructure of the Arthritis Source.
- Basia Belza, Associate Professor of Biobehavioral Nursing and Health Systems (see item under "Related Projects").
- Yongmin Kim, Professor and Chair of Bioengineering, and Christopher Lau, graduate student in Bioengineering (see item under "Related Projects").
- Eight doctors from the UW Department of Orthopaedics and Sports Medicine authored articles for the Arthritis Source:
    i. Dr. Nancy Kadel
    ii. Dr. Tom Trumble
    iii. Dr. James Bruckner
    iv. Dr. Peter Simonian
    v. Dr. Mommahad Diab

vi. Dr. William Mills
vii. Dr. M. L. "Chip" Routt
viii. Dr. Frederick A. Matsen, III

Outside Agencies and Individuals

- Barbara Osen and the people of the Arthritis Foundation Help Line in Bellingham, Washington.
- Arthritis Foundation (AF): strengthening the Arthritis Source's connection to the Arthritis Foundation with a visit from the Arthritis Foundation CEO, Tino Mantella, and the presentation of the Arthritis Source at the American Juvenile Arthritis Foundation National Conference, Bellevue, Washington. August 24, 2001.

Papers:

- Turns, J. and T. Wagner (submitted). "Listening to the Learners: A Case Study in Health Information Website Design." 2001 Annual Conference of the Society of Technical Communications, Nashville, TN.
- Turns, J., K. Liu, et al. (submitted). "Moving toward Knowledge-building Communities in Health Information Website Design". Computer Supported Collaborative Learning, Boulder, CO.
- Shelton, B. E., J. Turns, et al. (submitted). "Integrating an Information-Intensive Website into Pedagogical Practice." *Behavior and Information Technology*.
- Turns, J. and Liu, K (2000). "Arthritis Source Online Survey Results." PETTT Technical Report.
- Liu, K., Turns, J., and Wagner, T. (2000). "Phone Interview Results." PETTT Technical Report.

Presentations

- Turns, J., Wagner, T., Liu, K. (2001). "Q_x-> Q_c -> A_c: Questions from Phone Interview." Presentation to Arthritis Source Research Group. June 2001.
- Shelton, B. (2001). "Integrating an Information-Intensive Website into Pedagogical Practice." Presentation to the College of Education, May 2001.
- Turns, J. (2001). "Listening to the Learner: Strategies, Examples, and Implications from Research on a Medical Information Website." Presentation to the Department of Technical Communication, March 2001.
- Louie, A., Macklin, S., and Warren, R. (2001). "Design Heuristics for Creating Tailored Patient Education Materials for the Web," Presentation to the Selected Topics in Health Informatics group, November 2000.
- Warren, R., Louie, A., and Matsen, F. (2001). "Design Heuristics for "The Arthritis Source" Web Site: Improving Search Engine Position and Processing User Feedback for Quality Improvement." Poster at the American Medical Informatics Association 2001 Symposium, November 2001.

Related projects

- Seattle Foundation Grant submitted with the "eGroup."

- eMedicine and patient-centered health care: working with Yongmin Kim, Professor and Chair of Bioengineering, and Christopher Lau, graduate student in Bioengineering.
- Discussion with Basia Belza, Associate Professor of Biobehavioral Nursing and Health Systems, about her research grant proposal to the National Institute of Nursing Research, entitled "Web Based Program to Improve Activity Adherence in Osteoarthritis."

Contributors to this report

Kristen Shuyler, Tracey Wagner, Jennifer Turns, Scott Macklin

Appendix A-4. Video Traces

Description

Video Traces is a system that makes it easy to capture a piece of rich digital media, such as video or a digital image, and to annotate that media both visually (using a pointer to record gestures) and verbally. The resulting product is a "video trace": a piece of media plus its annotation—in essence, a recorded "show & tell". Traces can be viewed by their creator, exchanged with others, and further annotated for a variety of teaching and learning purposes. The system provides a unique opportunity to capture embodied knowledge and educational interactions by supporting the most common ways people communicate their ideas—through talking, showing, and pointing.

The Video Traces project serves PETTT goals in a number of ways:

- **Explore the interplay of technology and pedagogy in real settings:** We have collaborated with individuals both within and outside of the University, and have explored educational uses of Video Traces in settings such as dance studios, architectural sites, and science museums.
- **Facilitate thoughtful and innovative educational technology uses:** We have found that using Video Traces prompts reflection on the part of both learners and instructors, and in several cases has inspired instructors to adopt innovative new strategies for teaching their courses and for assessing student learning.
- **Make strong connections between research, design, and practice:** We have used our observations about how people use Video Traces and our interviews with learners and instructors to inform the redesign of the software and generate further questions for research.

Background

Video Traces was originally conceived by Dr. Reed Stevens in 1993. At that time the system envisioned by Stevens (cf. Stevens & Hall, 1997) could not be implemented at a reasonable cost. PETTT began work on this project in February 2001, collaborating with Stevens on the system design, and developing the Video Traces software. PETTT has continued its collaboration with Stevens and has since studied use of the software in a variety of educational settings.

Specific Activities

In our first six months of this project, we have focused on two general questions: 1) How might such a technology be used in different settings and disciplines that are relevant to faculty and students at the University of Washington? 2) How might the tool be refined to better support teaching and learning in a variety of contexts?

Our activities with Video Traces reflect the PETTT approach to research: we have studied the use of Video Traces in real settings and have used the results of our studies to guide the redesign of the software.

Designing and Developing the Video Traces Software

We began this project by designing and developing a "first draft" of the software that was piloted at three science museums nationwide. Our goal was to create software which would make it easy to create traces using everyday resources (e.g., watching, talking, pointing) and which would also take advantage of the unique affordances of the technology (e.g., changing the video speed, sketching on the video). Our first version of the software was created in approximately 6 weeks.

Exploratory Studies in Three Settings

Our early research with Video Traces consisted of three exploratory studies of its use in very different settings. In each setting, we introduced the tool, observed the ways in which learners used it, and talked to learners and instructors about their experiences. Our goal was to use these exploratory studies to gauge the types of educational settings for which Video Traces is an appropriate educational technology, to guide the redesign of the software, and to generate ideas for more formal, in-depth studies of Video Traces.

Interactive Science Museums

Science museums are an interesting setting for a system such as Video Traces because meaningful learning often occurs by watching people's interactions with one another and with the exhibits; however, these interactions are ephemeral and usually too short for sustained inquiry to occur. Video Traces provides an opportunity for people to represent their own ideas in these settings and to leave a trace of these ideas with which other visitors can engage.

Our first study of Video Traces took place in conjunction with a grant to Stevens from the Center for Innovative Learning Technologies (CILT), a distributed center for collaborative research on educational technology funded by the National Science Foundation. Educational researchers in three locations around the country used Video Traces at science museums, and came together in Seattle to discuss their findings. Also attending this meeting were other educational technology leaders whose interests revolve around the use of annotation tools for improving K-12 teaching.

Museum visitors worked alone and with others to create a variety of traces: they used the tool to record observations, experiments, questions, and explanations. The experience of creating traces provided visitors with opportunities to re-present, revise, and reflect on their ideas and perceptions. Based on our initial observations, we envision creating a new version of the Video Traces software that will allow visitors to respond to one another's traces and contribute to a learning conversation that is distributed over time. These collections of traces could be useful to visitors inside the museum, to exhibit designers, and as durable objects that could be brought back to classrooms for extended discussions of the museum field trip experience.

UW Department of Dance - Choreography Class

Our second experience with Video Traces was with an undergraduate choreography class at the University of Washington. Video Traces seemed like a natural fit with dance—a field in which people use their bodies to represent ideas and in which they make frequent use of videotape to document their work. Video Traces provided learners with an opportunity to use video not

simply as a medium for documentation, but as an interactive tool that supports reflection and the development of new ideas over time.

We worked with a class that was in the final quarter of a three-quarter sequence in dance composition. The instructor gave students three assignments: to choreograph a modern dance piece, a musical theater piece, and a site-specific dance in an outdoor location. Students rehearsed with their dancers, previewed their compositions for the class, received feedback through class discussion, revised their compositions, and presented a final performance.

In this pilot study of Video Traces, our goal was to capture different ways in which students might use Video Traces in their process of creating a dance. We were interested in ways the tool might affect students' thinking about their work and how it could enable collaboration. Six students in the choreography class used Video Traces over the course of two class assignments. We met with students one to several days after we recorded their dance piece. Students were given instructions about how to use the software, and were left in private to view and annotate the Video Trace of their work. We interviewed students individually about their experiences in the class and about their use of Video Traces.

We found that students used Video Traces in a number of ways to represent ideas related to their work, including planning for rehearsals, documenting aesthetic intentions for the dance, and making connections between formal concepts and practice. Students often used the pointer tool to indicate new potential pathways for movement or uses of the performance space. Students and the instructor suggested several ways in which they could envision using Video Traces to support collaborations and assessment.

UW College of Architecture and Urban Planning - Straw Bale Design/Build Project

Our third experience with Video Traces was on a straw bale construction site on the Cheyenne Indian Reservation in Montana. This project was part of an architecture design/build studio course, in which students learn about construction materials through hands-on experience, and subsequently design a structure that will be built by students in the course the following year. The instructors of this course were interested in using Video Traces to document the straw bale construction process so that it could be made available to others in Native American communities.

In this exploratory study, we spent four days on the construction site shooting video and working with the students and instructors to create traces. By being on-site, we modeled the process of creating Video Traces so that students in the course could continue the process after we left the site. As a result of our presence, students have incorporated Video Traces into their final projects for the course.

Redesigning the Video Traces Software

Our experiences in these three settings guided our redesign of the Video Traces software. We have created a design that incorporates features to better support the types of uses in which instructors and learners have expressed an interest. A major component of the redesign will be to create a Web-based version of Video Traces. Other research-based design revisions include

the ability to make video traces in response to those made by others; an opportunity for multiple persons to annotate the same video clip; an option to record original sound and regulate its volume when making an annotation; the ability to freeze a frame of the video and continue annotating; and a format that allows users to link traces in a threaded discussion.

Current Directions

Software Development

We are currently in the process of implementing and testing the redesigned version of Video Traces. We anticipate that Video Traces will eventually be made available to the UW community through Catalyst.

Research Studies

We have planned a research study as part of a year-long choreography class beginning Fall 2001. With this study, we hope to deepen our understanding of how teachers teach and learners learn in this particular discipline, and of how Video Traces can support and extend these activities. Video Traces will be integrated into the normal classroom activities and will be used in a variety of ways by the instructor and by all students in the class. Some of the research questions we intend to address include: 1) How might this tool affect discourse in the learning environment? In what ways does class discussion influence the annotations that teachers and learners create? In what ways do the annotations influence class discussion? 2) What types of ideas do teachers and learners represent using Video Traces? 3) In what ways does Video Traces support collaborative learning, and what types of collaborations occur? 4) In what ways does Video Traces influence the beliefs that teachers and learners have about learning in their particular discipline? 5) What features of the software support these activities? How might the software be redesigned to better support teachers and learners?

Exploratory Research

We currently have several exploratory studies planned. These studies, which will take the same form as our earlier exploratory studies, will expand the range of settings and contexts in which Video Traces is used. These new contexts include the School of Medicine (e.g. helping older adults practice exercises correctly; teaching medical students surgical techniques), the Seattle Art Museum and Henry Art Gallery (sharing interpretations of art, facilitating learning from field trips) and development of a virtual tribal arts museum.

Overall Impacts

PETTT Personnel

- Reed Stevens
- Gina Cherry
- Janice Fournier
- Greg Bowman
- Scott Macklin

UW Individuals

- Maria Simpson, Assistant Professor, Department of Dance
- Rob Kitsos, Lecturer, Department of Dance
- Sergio Palleroni, Associate Professor, Architecture
- Chuck Henry, Research Associate Professor, Forest Resources
- Greg Schmale, Assistant Professor, Orthopedics & Sports Medicine
- Sara Kim, Assistant Professor, Family Medicine
- Michael Goldberg, Associate Professor, Interdisciplinary Arts & Sciences, UW Bothell
- Christine Goodheart, Director of Community Arts Partnerships, Office of Educational Partnerships and Learning Technologies
- Richard Karpen, Professor, Composition, School of Music

Outside Organizations and Individuals

- Red Feather Development Group, Bellevue
- Northern Cheyenne Reservation, Montana
- David Riley, Associate Professor, Construction Management, Penn State University
- David Taylor, Director of Exhibits, Pacific Science Center
- Joe Polman, University of Missouri, St. Louis
- Rogers Hall, University of California, Berkeley
- Lawrence Hall of Science
- St. Louis Science Center
- Bellevue Art Museum
- Center for Innovative Learning Technologies

Papers

- Stevens, R., Cherry, G., & Fournier, J. (accepted). Video Traces: Rich Media Annotations for Teaching and Learning. Computer Supported Collaborative Learning, Boulder, CO.

Presentations

- Center for Innovative Learning Technologies (CILT)
- PETTT Spring Forum
- College of Education Curriculum and Instruction (EDCI 505)

Contributors to this report

Gina Cherry and Janice Fournier

Appendix A-5. Tutored Video Instruction (TVI)

Description

The Computer Science & Engineering Department at the University of Washington has experience distributing videos of Introductory Programming lectures to local colleges and community colleges for their use in the Tutored Video Instruction (TVI) model. PETTT has contributed resources to the production, the evaluation, and the development of course materials for TVI courses. Course materials and course design are continually assessed to inform the development and modification of teaching and learning aids. PETTT's contributing during the 2000 – 2001 academic year involved the creation of studio-produced lecture videos, Classroom Assessment Tools (CATs) to foster student discussion, and quizzes corresponding to each lecture video. Community college students and instructors benefit from the use of UW generated materials. Instructors utilize lecture videos instead of creating their own lecture slides while students have the opportunity to participate in courses similar to those at the University of Washington. The TVI model combines the benefits of lectures (the lecture videos) with the benefits of small class discussion.

- **Explore the interplay of technology and pedagogy in real settings:** We continually assess the current technology and course materials in the setting of colleges and community colleges across the state of Washington. Our current assessment stage involves the evaluation of Classroom Assessment Tools (CATs) as supplementary aids to the lecture videos.
- **Facilitate thoughtful and innovative educational technology uses:** The TVI model in concert with Classroom Assessment Tools is an innovative strategy to generate student discussion.
- **Make strong connections between research , design, and use:** Our research includes site observations and student surveys continues to inform the design of new tools and methodologies to improve the experiences of instructors and learners using TVI course materials. Once TVI materials are created, we explore their use in real classroom settings.

Background

The Tutored Video Instruction (TVI) model utilizes a set of recorded lectures as the main medium for content delivery. A tutor for a TVI course encourages students to pause the tape to ask questions about the material. These periodic discussions serve to keep students involved in the course to better understand the lecture material. Gibbons pioneered the TVI model in order to combine the benefits of lecture with the benefits of small group discussion [GKD77].

The TVI materials provided by the Department of Computer Science & Engineering at the University of Washington have been used for the introductory programming courses CSE 142 and CSE 143 at community colleges across the state of Washington. The experiences with previous offerings of the courses at community colleges did not necessarily meet the goals of TVI instruction [ADP01]. Discussion frequency was quite low with many of the interactions

initiated by the tutor. In a more formal observation, Kors notes that tutored-initiated discussions account for 75 percent of the discussions and lasted, on average, under two minutes [Kor01]. The work described in this report provides tools to springboard discussions about topics presented in the studio-produced CSE 142 lectures.

The newest feature of PETTT's work in TVI is a set of online Classroom Assessment Tools, or CATs. We built Classroom Assessment Tools (CATs) to supplement each TVI lecture. Classroom Assessment Tools allow instructors to collect information from their students about what they are learning in class [AC93]. CATs are typically ungraded exercises submitted anonymously by students, producing honest feedback from the students. With frequent use of CATs, instructors can learn about students' misunderstandings of concepts before a major programming project or exam. These tools also provide context for students to raise questions about lecture content. In addition to ungraded exercises, we also built quizzes (instructors can decide if these should be scored) to test the central concepts of each TVI lecture.

This work is part of PETTT's ongoing project studying TVI pedagogy and technology in CSE 142 and CSE 143 offered at Washington state colleges. This work continues the research endeavor of answering the fundamental question of how learners and teachers can use TVI technology effectively. Additionally, this work includes the continuous evaluation of assessment tools to encourage discussion in a TVI course.

Specific Activities

Producing Videos

During August and September 2000 new lecture videos were produced for the TVI version of CSE 142. This production resulted from field studies conducted by PETTT members and student reactions to the previously offered TVI courses. Much of the previous in-class lecture videotapes focused on UW specific topics and these portions of the videos were irrelevant to the students at community colleges. The new studio produced lecture videos contain only course content.

Training TVI Instructors

In May 2001 instructors from Heritage College and Wenatchee Valley Community College spent a day with the UW Computer Science & Engineering Department to discuss the TVI courses. Several PETTT personnel and professors of CSE 142/143 attended the training workshop. The goal of this meeting was to inform the instructors about appropriate uses of the TVI materials in the TVI model. PETTT contributed ideas based on previous research to inform future TVI instructors effective uses of TVI materials.

Discovering Goals

The initial stage of building assessment tools involved communication with current and future TVI instructors. Assessment tools are designed to satisfy certain educational goals [AC93]. In order to build tools that meet the goals of the TVI instructors, four community college instructors

completed the goal inventory survey presented in *Classroom Assessment Techniques* by Angelo and Cross [AC93]. The results of the surveys enabled us to build appropriate tools to supplement the CSE 142 lectures. PETTT funded a graduate student to research and create Classroom Assessment Tools.

Classroom Assessment Tools

In order for a TVI course to be successful, it is important that the students enter into discussion about topics that are confusing to them during the course of watching a video and at its conclusion. Also, discussions encourage students to use appropriate terminology that they are learning in the course. The ideal model for TVI discussions is the involvement of students to answer each other's questions without relying heavily on the instructor.

We built Classroom Assessment Tools (CATs) as supplementary material for TVI instructors so they can address topics that might be confusing to students. Also, students might think the material presented in a video is quite clear until they have to work with the new concepts. These CATs give the students an opportunity to further their learning and discover concepts that might be difficult for them. Hopefully, these CATs will springboard student discussion. Because discussion is extremely important for TVI courses, most of the CATs built are group or entire class exercises. Two to four CATs were built per lecture; instructors may choose appropriate CATs for their classes.

Examples of CATs include the minute paper (students write a short summary of the most important concepts from the lecture) and the muddiest point (students submit a concept that is confusing to them). Other more specific tools were also developed to test content in the lectures. These include analogies, programming activities, design activities, dramas, memory matrices, and application examples. The CATs can be found on the course Website:

http://www.cs.washington.edu/education/online/cse142/

Quizzes

Because the TVI model assumes that tutors are not necessarily trained in teaching and building classroom resources, an additional resource that we provide to CSE 142 TVI instructors is a set of quizzes (one per lecture). These quizzes test main concepts described in the lectures. Quizzes also provide a context for students to enter into a discussion about programming concepts, much like quiz sections in the on-campus offering of CSE 142. In addition to providing a discussion framework, quizzes can motivate students to pay attention to the lecture material. Frequent quizzes provide students a mechanism to see flaws in their understanding before applying concepts on homework assignments and exams. The quizzes can also be found on the course Website. The quizzes are password protected to ensure privacy of the questions for instructors; to gain access to the quizzes, please contact Tammy VanDeGrift at tammy@cs.washington.edu.

http://www.cs.washington.edu/education/online/cse142/

Classroom Observation

Two PETTT team members conducted a site visit at Heritage College on September 18, 2001 to observe a CSE 142 TVI course. We assessed the TVI videos and Classroom Assessment Tools by speaking to five students and the instructor. We also observed one class session to see how the students and professor use the technology.

The class that we observed had 12 students in attendance (8 females, 4 males). During the class, the instructor played one lecture lasting 25 minutes and then had students complete a Classroom Assessment Tool provided in the set of TVI materials. Students worked on the exercises individually and in pairs. During the playing of the video, students did not ask the instructor any questions but asked for his help while working on the CAT.

The TVI model described by Gibbons [GKD77] was not employed exactly in this TVI classroom; however, the students seemed to be learning in the model used by the instructor. The instructor gave positive remarks about the TVI videos and CATs.

Current Directions

We are interested in studying how teachers and learners can use TVI technology effectively. During the 2001 - 2002 academic year, three instructors will use the Classroom Assessment Tools to supplement the TVI videos. Other instructors will use the assessment tools in traditional classrooms. We will evaluate the effectiveness of the CATs through discussions with the instructors, surveys designed for the instructors, surveys designed for the students, conversations with the students, and classroom observations. We have data from two sites as of October 2001 and will have more results concerning the use of TVI materials after the completion of fall quarter/semester.

Overall Impacts

Numbers:

- Five college instructors will use the TVI videos and/or Classroom Assessment Tools during 2001 - 2002 academic year.
- Approximately 100 college students will learn from the TVI videos and/or Classroom Assessment Tools during the 2001 - 2002 academic year.

Personnel:

- **Computer Science & Engineering Department**
- Richard Anderson (Professor, helped with video recording and Classroom Assessment Tools, community college instructor contact, designed and led TVI training workshop)
- Martin Dickey (Professor, delivered lectures for studio video recording)
- Hal Perkins (Professor, delivered lectures for 142/143 video recordings)
- Ed Lazowska (Former Chair and Professor, helped with development of TVI course materials, attended TVI training workshop)

- Tammy VanDeGrift (Graduate Student, developed and designed Classroom Assessment Tools and quizzes, designed surveys for the assessment of the TVI program, attended TVI training workshop, observed course at Heritage College)
- Rob Prieto (Multimedia Computer Support Assistant, helped with production of TVI videos)
- Fred Videon (Software Engineer – Professional Masters Program & Distance Learning, helped with the production of TVI videos)
- Melissa Albin (Course Coordinator, helped with production of TVI videos)

- **Program for Educational Transformation through Technology (PETTT)**
- Lori Postner (Graduate Student, proofread Classroom Assessment Tools and quizzes, helped design surveys for the assessment of the TVI program, observed course at Heritage College)
- Jennifer Turns (Research Scientist, attended TVI training workshop)
- Scott Macklin (Director, attended TVI training workshop)

- **Center for Engineering Learning and Teaching (CELT)**
- Angela Linse (Instructional Consultant, provided resources for assessment tools)

- **UWTV**
- Fran Kwok (helped with the production of TVI videos)

- **Outreach**
- Robert Ozuna (UW Program at Heritage College, helped with contacts at Heritage College)

- **Community Colleges (Participants in using TVI materials):**
- Ryan Landvoy (Instructor, Heritage College)
- Kit Arbuckle (Instructor, Wenatchee Valley College)
- Barbara Goldner and Dennis Shaffer (Instructors, North Seattle Community College)
- Daniel Kao (Instructor, Central Washington)
- Centralia Community College
- Bob Crestionson and Rebecca Sliger (Instructors, Highline Community College)
- Matt Weaver (Instructor, Shoreline Community College)
- Janet Hannan (Instructor, Green River Community College)

Paper:

VanDeGrift, T. and Anderson, R. (submitted) Classroom Assessment Tools as Discussion Frameworks in CS 1. The 33rd Technical Symposium on Computer Science Education, February 26 – March 2, 2002, Northern Kentucky – The Southern Side of Cincinnati.

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[ADP01] Richard Anderson, Martin Dickey, and Hal Perkins. Experiences with Tutored

Video Instruction for Introductory Programming Courses. *Proceedings of SIGCSE.* February 2001.

[GKD77] J. F. Gibbons, W. R. Kincheloe, and K. S. Down. Tutored videotape instruction: A new use of electronics media in education. *Science*, 195(3), 1977.

[Kor01] Kurt Kors. Redesigning Tutored Video Instruction: Recommendations for Higher Education Programs Using TVI. Technical Report, Program for Educational Transformation through Technology, University of Washington, 2000.

Contributor to this report

Tammy VanDeGrift

Appendix A-6. Facet-based Assessment

Description

Facet-based assessment is an innovative way for teachers to continually monitor their students' understandings. PETTT has provided the resources to investigate how facets can be identified and used. Through PETTT's support we have documented the process of creating a facet-base, piloted its use in a large lecture course and supported development of an online tool devoted exclusively to facet-based assessment.PETTT's continued work in this innovative assessment technique will help instructors receive feedback about their students' knowledge in a timely manner so that it may impact their teaching.

- **Explore the interplay of technology and pedagogy in real settings:**
  Through the use of Catalyst's WebQ tool we were able to assess students' knowledge entering the second quarter introductory programming course using our facet-base to help the instructor learn what knowledge his students brought into the course. The use of this tool allowed us to provide almost immediate feedback to the instructor of the large lecture class to directly impact his teaching. This type of innovative assessment helps to bridge disconnects between the teacher's belief about the students' understandings and the actual students' knowledge.
- **Make strong connections between research, design and practice:**
  The facet-based approach to assessment is based upon science of learning research. By listening to students and drawing upon teachers' expertise we were able to develop a facet-base of students' understanding about the programming concept of variable. We then combined this assessment technique with an existing online tool to gather and analyze our data.

Background

Current thinking on educational reform and change suggests that assessment should be made central to learning situations. Assessing student understanding can help an instructor determine what to teach and how to teach it. However, it can be difficult to fully integrate assessment into learning environments given the time required to develop the assessments, execute the them, and interpret the data. Given this set of issues, PETTT is interested in how technology can be used to support assessment, particularly innovative assessments. As a result, one collection of PETTT activities focuses on making facet-based assessment a feasible approach at the University of Washington.

A *facet of student thinking* is a phrase used by Minstrell (2001) to describe students' thinking in a way that makes sense to teachers and researchers. Each facet is a description of a single idea whose purpose is to provide teachers and scientists with a way of describing what students know and do based upon the students' explanations and actions during the course of classroom instruction. We identified facets of students' understanding about variables in the C programming language. One facet cluster we developed was students' ideas about what is stored in a variable when it is declared. Some of the facets in this cluster included:

- A variable is empty upon declaration.
- The initial value in a variable is zero.
- The initial value in a variable is *garbage*.
- A variable will have the last value stored in that memory location upon declaration.

Specific Activities

Challenges in the use of facet-based assessment include: (a) identifying facets of student understanding the relevant area and developing the overall facet library, (b) developing assessment strategies for determining which facets students hold, and (c) knowing how to make instructional decisions based on the set of facets that students hold, individually or collectively. We have selected activities that address these challenges.

Our overarching goal is to look at the process of creating a facet-base. In our first attempt, we are developing and validating a facet-base for the concept of a variable (a fundamental concept in computer programming). In the past year, we have been involved in two activities related to this goal.

Development of a Facet-based Assessment for Computer Programming I (CSE 142)

In order to understand the role that facet-based assessment can play in teaching and learning at UW, it is necessary to understand what is entailed in developing a facet-base, designing a facet-based assessment, evaluating that assessment, and using it in a learning situation. In our first activity, we sought to develop this understanding by exploring the steps involved in creating a facet-based assessment for the concept of variable in CSE142, a large lecture course. Because CSE 142 is a large lecture course, it can be very difficult and time consuming to find out what students know in order to impact instruction. We selected a constrained topic – students' knowledge of the concept of variable – in order to focus our attention primarily on the processes of constructing and using the assessment.

This project began Spring Quarter 2001 during which we developed the facet-base and collected pilot data using a questionnaire we developed on WebQ. During the summer quarter we revised the questionnaire and gathered data from students enrolled in CSE 143, Computer Programming II.

We identified facets about students' ideas about variables by looking at the research done by the computer science education community. Through the documentation of common programming mistakes and misconceptions about programming we created a list of each student idea cited in the literature. We used introductory computer programming textbooks as well as interview data to supplement our list. We grouped similar ideas into common ideas or themes and ranked them into a continuum, from those most desirable for students to possess to those that are most problematic for students to think.

To validate the facet-base we developed a survey that allowed us to see if students held different understandings under different conditions. To gather additional information about students' understanding each question included a place where students could write in their own explanation and a measure of how sure they were of their answer.

We used Catalyst's WebQ tool to place the questionnaire on-line. We enlisted the help of the introductory programming (CSE 142) instructors to get a few students to pilot the questionnaire. Seven students completed it. This allowed us to see the quality of the questions and alternative answers provided by the students. We used the students' responses to re-work the wording of several of the questions as well as adding and deleting choices.

We enlisted the help of the CSE 143 instructor (Computer Programming II) to have students who were just starting the second quarter programming course complete the questionnaire. We received responses from 136 students. The data indicated that the facet-base for variable touched upon many ways students think about variables. It showed places where students had conceptual difficulties and helped the instructor gauge what students' ideas were at the beginning of the course. For example, 20% of the students believed that declaring a variable gives it an initial value and 17% believed that the name of the variable gives the computer information about what to store there. Neither of these ideas is correct and are taught early in the first quarter programming course. The instructor was surprised that students entering the second quarter would still hold such beliefs.

From this pilot study we learned two things. First, our process for developing a facet-base did provide us with a fairly complete understanding of the various ways students talk about variables. Second, we learned that students' understandings of variables are fragmented – they understand certain aspects of variables while confusing others. Facets are a good technique for seeing this type of understanding.

Linking Facet-based Assessment and Student Online Discussion

One way to make facet-based assessment viable is to link it to ongoing activities in classrooms. The INFACT suite of tools, designed and developed originally by Dr. Steve Tanimoto, provides exactly this type of functionality. Despite their potential applicability by many faculty on campus, the INFACT suite of tools has had limited applicability to date because they have not been integrated with the other tools made available to educators at the university (i.e., the Catalyst toolset).

PETTT has been working with Dr. Tanimoto to determine how the INFACT tools can be incorporated into the Catalyst suite of tools. To date, PETTT has funded two undergraduate students to work on programming and development associated with the INFACT project. Specifically, PETTT (through the work of these undergraduate students) has contributed the following to the development of INFACT and the porting of INFACT to the Catalyst toolset:

- Execution of a focus group to determine instructors' preferences about design.
- Design a markup tool.

Current Directions

In the upcoming year, we are continuing the work with INFACT and with facet-based assessment in CSE.

- In the context of CSE, we are currently creating a second facet-base of students' understandings of objects in JAVA. Students responded to open-ended questions answered in class as part of a classroom assessment. We have a set of responses from before the first exam and a set from before the final. Thus far we have organized the

students' responses into categories and are looking for common themes. Our goal is to repeat our above process to create and test a facet-base that can be used in the Introductory Programming I classes.

In the context of INFACT, we plan to finish porting INFACT to the Catalyst environment and release it to the university faculty. We plan to pilot this tool during Winter quarter to understand what students know about programs and programming upon entrance to the introductory course. We will initiate conversations through the INFACT Forum and use the markup tool to identify and cluster facets. This will provide us with a new way of developing a facet-base and providing instructors with feedback.

Overall Impacts

Numbers

- Two hundred forty-three students enrolled in CSE 142 & CSE 143 participated in our facet development over two quarters.
- Four Computer Science instructors helped us.

Personnel

- PETTT
  - Lori Postner
  - Jennifer Turns
- Computer Science Department
  - CSE 142 Instructors (Spring 2001) - Martin Dickey and Steve Wolfman
  - CSE 143 Instructor (Summer 2001) - Brian Tjaden
  - CSE 142 Instructor (Summer 2001) - Hal Perkins

Papers

- Postner, L. and Turns, J. (submitted). Computer-Based Assessment of Students' Knowledge about Variables: Design and Results. The 33rd Technical Symposium on Computer Science Education, February 26-March 2, 2002, Northern Kentucky - The Southern Side of Cincinnati.
- Postner, L. (2001). Computer Science Education Research on Programming: What We Know and How We Know It, PETTT Technical Report. Available on-line [http://depts.washington.edu/pettt/papers/]

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Contributor to this report

Lori Postner

Appendix A-7. Web-Ed

Description

Many instructors at the University of Washington are working individually to integrate educational technologies into their courses to improve how they teach and how their students learn. WebEd bridges the gaps that exist between individuals, projects, departments, schools, and programs by creating forums in which UW community members and field experts come together to share their experiences of teaching with technology. PETTT has become the administrator for WebEd, bringing its activities into the service of PETTT goals in the following ways:

- **Explore the interplay of technology and pedagogy in real settings:** Regular meetings serve as an avenue to present and discuss original PETTT research with members of our service community.
- **Facilitate thoughtful and innovative educational technology uses:** WebEd encourages pedagogical reflection and improvement by providing informal peer review and networking opportunities in three interrelated focus areas: pedagogy, technology, and research.
- **Make strong connections between research, design, and practice:** Meetings and online discussions provide faculty with structured events in which to use the insights of their colleagues to evaluate current applications of educational technologies. Expert discussants facilitate the conversation and make explicit links between research, design, and practice.

Background

WebEd began in the summer of 1997 out of organizing efforts of two graduate students and supportive faculty in the UW College of Education. Although the group has an inspired vision of a community of scholarship, without administrative support WebEd has struggled to stay alive. In Spring 2000, PETTT recognized and seized the opportunity to rebuild WebEd and install the group as a regular, permanent networking and dissemination opportunity on educational technology issues at the UW.

To foster a community of scholarship, PETTT must create spaces in which teachers may come together to share with one another their challenges and successes using educational technologies. These exchanges engender a culture of thoughtful exploration in pedagogy and assessment, a cultural state critical to achieving transformative assessment, as described by Thomas Angelo in the *American Association of Higher Education Bulletin* (Angelo, 1999).

Educators draw parallels between their struggles and achievements at WebEd meetings, finding new answers to old problems and sharing passionate debates and inspiring stories of teaching and learning. Indeed, nearly three-fourths of respondents to the recent Faculty Survey of Instructional Technology (2001) chose *learning from colleagues* as their preferred method of learning about computers. The act of creating spaces for collegial dialogue is a powerful tool by which PETTT will lay foundations for endurable, self-sustaining relationships among UW community members.

WebEd extends PETTT's ability to provide a framework supporting ongoing community dialogue on educational technology. From the beginning, WebEd has encouraged:

- **Pedagogical Reflection And Improvement:** The main focus of the group is to help its members learn from each other and field experts how to improve the teaching and learning in their courses through the use of educational technologies.
- **Informal Peer Review:** Presenters have the opportunity for face-to-face, informal peer review of their current projects by interested colleagues from multiple disciplines.
- **Connecting With Colleagues:** Participants can network with like-minded teachers and industry professionals, making links with people and resources they might not otherwise be able to make.
- **Staying State Of The Art:** UW educators see how others are integrating innovative technologies into their courses, participate in demonstrations of the newest tools on the market, discuss the latest research on educational technologies in their fields, and build strategies for effectively applying those technologies.

Specific Activities

Management

WebEd has tried a number of approaches in the past to reach its constituency and involve new members, but with inconsistent results. By recruiting presenters, discussants, and reaching out to attendees, PETTT kept the group actively meeting until Summer Quarter, 2001. At that point, WebEd took PETTT's recommendation to put regular meetings on hold in order to convene Steering and Leadership Committee meetings. WebEd also took PETTT's recommendation to focus its attention on designing a more purposeful approach to serving the UW and planning a re-launch for Autumn Quarter, 2001.

Re-design

Based on our meetings with WebEd leadership, PETTT designed a new structure for WebEd, iterating on the presenter-discussant format to recommend three new organizing focus areas:

- Pedagogical Focus: Faculty present their applications of educational technologies.
- Research Focus: Students, instructors, and programs present their research.
- Technology Focus: Developers from inside and outside the UW community present new technologies and products for Web-based education.

WebEd will use these new focus areas to more clearly communicate its purpose to the UW community, respond to future opportunities faster, and give better guidance to its selection of presenters. For example, upcoming 2001 topics include:

- Emerging Genres of Learning Technology (Pedagogical Focus)
- VirtualCase, the Case Method, and Problem-Based Learning (Technology Focus)
- Preliminary Results: Faculty Survey on Instructional Technology (Research Focus)

Re-launch

To heighten the awareness of WebEd opportunities for faculty in this new support structure, PETTT has designed a re-launch strategy with the following features:

- Logo created based on Steering and Leadership Committee Members' input

- Promotional materials distributed at all UW campuses announcing the re-launch
- Web site rebuild, http://depts.washington.edu/Webed/, including EPost discussions designed to extend WebEd's monthly meeting topics
- Co-branded PETTT and Educational Technology Development Group materials on Catalyst, http://catalyst.washington.edu/home.html, including semi-monthly "WebEd Pick" highlighting Web-based instructional materials of UW faculty
- *Windows on Computing*: Story in Autumn 2001 issue
- *OnTechNews*: Announcement in first email newsletter of Autumn 2001
- Email announcements to existing WebEd distribution lists, including University Week

Next Steps

PETTT will maintain a strong ongoing connection with WebEd in an administrative capacity, even after the re-launch is complete. In this way, PETTT will be able to provide the direct assistance necessary to ensure the continuing success of WebEd, while making informed recommendations to the group as to which educational technology issues are most current to the UW community.

UW Community Involvement and Impacts

PETTT administration of WebEd creates scaffolding for teachers and learners to find their own pathways with educational technology issues and reinforces PETTT's commitment to enhance the UW's educational community with open dialogue on technology use.

The Web site for WebEd includes documentation of outcomes from educational technology focus and special interest groups at UW, including meeting notes and archives of presentation materials. PETTT-recommended enhancements of this site will include ongoing EPost discussions of selected topics. Other Catalyst tools will also be embedded throughout the site to create unprecedented opportunities for discussion and collaboration among peers from disparate fields on educational technology issues.

Under the management of PETTT, WebEd has held twenty-two meetings, with presenters and discussants representing a wide range of disciplines, such as Business Administration, Orthopaedic Surgery, Construction Management, Drama, Psychiatry, ESL, Physics, and Information Science, to name but a few. WebEd has enjoyed participation by UW community members from the Seattle, Bothell, and Tacoma campuses, and has involved local community

colleges and learning centers, including the Seattle Community Colleges, Shoreline Community College, and the Puget Sound Center for Teaching Learning and Technology.

WebEd has sustaining sponsorship from participants in its Steering and Leadership Committees:

Mark Scott (WebEd Facilitator and Co-Founder), Educational Outreach
Michael Campion, Education at a Distance for Growth and Excellence
Richard Ells, Computing and Communications
Penelope Karovsky, Experimental Education Unit
Stephen Kerr, College of Education
Tom Lewis, Educational Technology Development Group
Scott Macklin, Program for Educational Transformation Through Technology
Catharine Reznicek, Puget Sound Center for Teaching, Learning, and Technology
Jonathan Sharpe (WebEd Co-Founder), Center for Ecogenetics and Environmental Health
Cliff Solomon, School of Nursing

Contributor to this report

Kurt Kors

Appendix A-8. Spring Symposium

Description

PETTT sponsors an annual spring symposium intended to bring faculty, staff, and students from across campus as well as individuals from industry and other institutions together in a setting to consider how current and emerging technologies and practices are extending or changing conventional concepts of education and learning. The format of the symposium includes a public forum and a working session of UW personnel. The symposium is captured on video, rebroadcast and made available via UWTV and the Research Channel.

The Spring 2001 symposium, titled ″Locating the Learner: Educational Uses of Technology and Rich Media,″ focused on innovative uses of rich media (video, audio, text and graphics), which allow learners to create knowledge as well as participate in communities of practice. Dean Patricia Wasley (College of Education) gave the opening remarks. The forum had two keynote speakers. Ricki Goldman-Segall, professor of computer and information sciences at the New Jersey Institute of Technology talked about "Computers, Cultures and Constructions: Locating the Learner in the Con/Text of Digital Video Cases." Reed Stevens, UW assistant professor of cognitive studies in education, talked about "Video Traces: Media Rich Annotations for Learning and Teaching."

Our activities serve PETTT goals in several direct ways:

- **Explore the interplay of technology and pedagogy in real settings:** The working session and public presentations create a public forum to share and discuss issues of coupling advances in learning technologies with advances in educational practice.
- **Facilitate thoughtful and innovative educational technology uses:** The forum allows members of the UW community to discuss how they have used rich media in their own teaching.
- **Make strong connections between research, design, and practice:** We bring in and match leaders (outside the UW) with leaders (inside the UW) in order amplify, extend, and showcase contemporary work in the field of the learning sciences and educational technology.

Background

Spring Symposium 2000

Speaker 1
Dr. Roy Pea, Director of the Center for Technology in Learning at SRI
"Towards Integrating the Sciences and Technologies of Learning for Education"

Dr. Pea's work involves the creation a seamless network between advances in technology, knowledge and learning. One of his aims is to create a national knowledge network for catalyzing best practices and new designs for improving learning with technologies among researchers, schools, and industries.

Speaker 2
Dr. Judy Ramey, Professor and Chair Technical Communication, UW
"Guidelines: Web Data Collection for Understanding and Interacting with Your Users"

The global growth of the World Wide Web challenges technical communicators to reconsider the methods we use to create designs that meet the goals and needs of our users. This presentation focused on taking advantage of the Web's potential for interactivity between designers and users. Dr. Ramey offered strategies for getting data from users of Web sites and using it for two main purposes: (1) analyzing audience and patterns of use to support continuous redesign, and (2) building a relationship or sense of community on a Web site.

Spring Symposium 2001

Speaker 1
Dr. Ricki Goldman-Segall, Professor Computer and Information Sciences, New Jersey Institute of Technology
"Computers, Cultures and Constructions: Locating the Learner in the Con/Text of Digital Video Cases"

Ricki Goldman-Segall is internationally recognized as the pioneer of an emerging field of study, digital video ethnography. After completing her doctorate at MIT's Media Laboratory in 1990, she established the Multimedia Ethnographic Research Library (MERLin) at the University of British Columbia, where she conducted longitudinal video-based research and designed media rich video tools and cases. Her articles can be found at the MERLin Web site, *http://www.merlin.ubc.ca*.

Speaker 2
Dr. Reed Stevens, Assistant Professor Cognitive Studies in Education, UW
"Video Traces: Media Rich Annotations for Learning and Teaching"

Reed Stevens examines and compares cognitive activity in classrooms, workplaces and science museums. He is exploring new ways to conceptualize cognition and is experimenting with new ways to organize learning environments. His specific interests include how mathematical activity contributes to various settings and how technology mediates thinking and learning.

To watch streaming video of the presentations, please see:
http://depts.washington.edu/pettt/events/

Specific Activities

The morning 2001 working session consisted of a series of 10-minute presentations. The intention of the morning session was to bring folks from across campus together to see, learn, and discuss how they are coupling their uses of educational technologies to educational practice with a specific lean to rich media (video, text, and audio annotation).

Presenters:

Mark Alway	Developer Educational Technologies Group: Peer Review tool

A.J Brush	Graduate Student CSE: WebAnn: Microsoft Text Annotation
Masashi Kato	Lecturer Technical Communication: Language Partner
Rick Matsen	Professor Orthopaedics: E-medicine (video)
Reed Stevens	Assistant Professor College of Education: Video Traces
Steve Tanimoto	Professor CSE: INFACT
Mike Wellings	Video Networking Engineer, UWTV
Greg Zick	Professor Electrical Engineering: CONTENT DM multimedia archive

Attendees:

Ed Lazowska (CSE)	George Bridges (OUE)
Pat Wasley (CoE)	Tom Lewis (CTLT)
Amy Philipson (UWTV)	Cytnhia Fugate (Bothell)
Stuart Sutton (Information School)	Bill Corigan (UWEO)
Judy Ramey (TC)	Louis Fox (OEP)
Debra Friedman (Provost Office)	Cliff Solomon (Nursing)
Doug Shaad (Health Sciences)	Oren Sreebny (C&C)
Kody Janey (Libraries)	Dave Bargeron (Microsoft Research)

A reception followed the forum in Mary Gates Hall Commons. Faculty from Health Sciences and folks from the Educational Technology Group gave demonstrations of educational technolies. Representatives from Adobe, Apple, Macromedia and Real Networks showed off some of their new technologies and tools.

Contributor to this report

Scott Macklin

Appendix A-9. Faculty Survey

Description

Computing and communications technologies are becoming increasingly central to our everyday lives and particularly to the way we at the University of Washington (UW) carry out our educational mission. A variety of programs and initiatives have been created to assist teaching faculty at the University who wish to incorporate technology in their teaching, but little has been known about how such technologies are actually being used. To provide preliminary information on faculty use of technology, a survey of UW faculty was carried out in winter 2001. This survey was designed to obtain information regarding current and desired uses of technology to support instruction, and resources needed to improve such uses. The survey was sponsored by the Provost's Office, the Faculty Senate and the Faculty Council on Educational Technology, and carried out by the Office of Educational Assessment (OEA) in collaboration with PETTT. A description of the survey and preliminary findings are reported at: [http://www.washington.edu/oea/0106.htm]. Additional analyses will be carried out to inform decision making at various levels throughout the University.

The survey contributes to goals of PETTT in several ways:

- **Explore the interplay of technology and pedagogy in real settings:** The survey was developed to obtain information regarding current and desired uses of technology to support instruction in order to increase faculty awareness of ways in which technology can be used in service of instruction.
- **Facilitate thoughtful and innovative educational technology uses:** The process of conducting the survey was collaborative, intending to contribute to a University-wide conversation about uses of instructional technology and pedagogy in general
- **Make strong connections between research, design, and practice:** The results of the survey will help inform decisions within UW departments, divisions and schools at the University regarding allocation of resources and will provide baseline data on the use of instructional technology at the University.

Background

A survey of instructional faculty was carried out through campus mail and online. We anticipated that the response rate to the survey would be fairly low given the length of the questionnaire and the workload of instructional faculty. A variety of strategies and methods were used to encourage response. We chose to conduct the survey early in winter quarter as the time in which instructors would be most available to respond. In the second week of January, the staff newspaper published an article by the FCET chair emphasizing the importance of faculty participation. This was followed by several email and hardcopy mailings, each of which included the survey URL. Anonymity of response was emphasized.

Specific Activities

Sample: all individuals (faculty, teaching assistants or other) who were listed as instructor of record for at least one class during winter, spring or autumn quarter in 2000. Participants were eliminated from the sample if they did not have usable addresses, were no longer employed at the UW, or were on leave or deceased. Additionally,

300 names were reserved for use in another study. 6,495 individuals were initially selected; the final sample size was 5,246.

Instrument: six-page back-to-back questionnaire in booklet format, also available online

Timeline:

1/11/01	email from PETTT director, Scott Macklin, to all sampled faculty informing of survey purpose and timeline (included URL for online questionnaire)
1/11/01	University Week article by FCET chair, William Zoller, regarding survey
1/19/01	first mailing of hardcopy questionnaire to all non-responders (cover letter from Provost, Lee Huntsman, included URL for online questionnaire)
2/1/01	email reminder from PETTT director to all non-responders (included URL for online questionnaire)
2/14/01	second mailing of hardcopy questionnaire to all non-responders (cover letter from OEA, Nana Lowell, included URL for online questionnaire)

Current Directions

We are currently planning and designing focus groups of faculty who indicated they would be interested in participating in further conversations regarding uses of technology in instruction at the UW. Over the course of fall quarter, we will be following up the survey with a series of focus groups. We are planning 10 groups, with a total of 100 participants. Each groups will last approximately an hour and a half. The groups will participate in conversations about their actual experiences with educational technology: what were their successes and failures? What have they been unable or unwilling to implement, and for what reasons? We also will try to get participants thinking about educational technology uses they might not have thought about before. The groups will give us a better sense of what it really means for instructors to think about and apply educational technology at the UW.

Overall Impacts

Sent to 5,246 UW instructors. Completed returns from 1,879 (35.8%) instructors. Impact on departments unknown; analyses and discussions currently underway.

PETTT Personnel

- Scott Macklin
- Kurt Kors
- Gina Cherry

UW Individuals

- Nana Lowell, Director OEA
- George Bridges, Acting Dean and Vice Provost Undergraduate Education

- Pat Wasley, Dean College of Education
- Fred Wolf, Professor and Chair Medical Education
- Don Wolfe, Interim Director Center for Instructional Development and Research
- Steve Hiller, Head, Science Libraries Libraries
- Julie Stein, Divisional Dean of Computing, Facilities, and Research Dean's Office, Arts & Sciences
- Steve Graham, Director of Computing Dean's Office, Arts & Sciences

Papers

- Windows on Technology

- N. Lowell and D.E. McGhee, *Faculty Survey on Instructional Technology 2001: Methodology and Preliminary Findings.* OEA Report 01-06, October, 2001. [http://www.washington.edu/oea/0106.htm]

Presentations

- WebEd

Other Folks using the data

- George Bridges, Acting Dean, Office of Undergraduate Education
  Julie Stein, Divisional Dean of Computing, Facilities, and Research, Arts & Sciences

- Educational Technology Development Group

Contributors to this report

Nana Lowell and Scott Macklin

Appendix A-10. eGroup

Description

The eGroup represents an ensemble of individuals who have programs up and running that relate directly to the eUW vision and who assert that such a system would help faculty serve the missions of the University of Washington by virtue of being generalizable, scalable, enhanceable, and enduring.

eUW vision: Imagine a system that leverages clinical enterprise for educational efforts. Imagine a system by which learners (doctors, patients, students) have one stop/just in time access to their clinical information and rich media knowledge sources. Imagine a system that allows patients to have bi-directional input of ultra sound information, blood analysis and/or video of recovery. Imagine a system that has in place an evaluation matrix mechanism by which folks can chart progress over against a set of learning/care objectives. Imagine a system that is responsive and driven by learner/patient needs with a content development process that extends the expertise of UW content experts/doctors and channels folks to UW medical services. Imagine a system that medical students working with faculty create content that is easily findable, contemporary, and authoritative and/also contributes to their learning objectives.

- **Explore the interplay of technology and pedagogy in real settings:** One of the central hypotheses of the eSystem is that the syllabus/content about a given condition or treatment organized in a multimedia digital library would be useful to a wide variety of users. For example if the user was a medical student, a physical therapist, a nurse practitioner, a doctor desiring medical education credit, a patient, a family member or a high-school student writing a term paper about diabetes, each of these individuals would potentially desire access to the same information. In our view, eUW would allow each user to penetrate the multimedia digital library to the depth and breadth of their individual need, irrespective of their initial level of familiarity and sophistication.
- **Facilitate thoughtful and innovative educational technology uses:** The second hypothesis regarding the eSystem is that patients and learners have many characteristics in common; specifically they have specific questions to which they would like to obtain authoritative answers. It is recognized that patients and students desire to use the Internet for information, but they are concerned about the accuracy, currency and authorship of the content they access on the Internet. The third hypothesis is that such an eSystem would allow learners to help drive the creation and formatting of content that meets their needs. In this environment, learners may pose important questions that they may be reluctant to pose in a classroom of doctor's office setting.
- **Make strong connections between research, design, and practice:** The eGroup creates an opportunity to conduct research on the following: The fourth hypothesis is that the eSystem would enable faculty to direct their attention to generating definitive answers to well-phased questions, rather than spending their answering the same questions repeatedly. The fifth hypothesis is that the eSystem would enable learners to pose questions ad libitum, exploring the knowledge at the perimeter of the topic immediately at hand. The sixth hypothesis is that

users of the eSystem would use it to access information ‘just in time’ rather than in the context of defined classroom or office hours.

Background

The eGroup at the University of Washington is poised to make a substantial contribution to the care of individuals with diabetes by advancing the concept of Diabetes Management Partnership. Our proposal is that the Seattle Foundation support our purchase of a substantial distributed content server, one time meaning based search system software that will together enable:

1. Authorized access by the patient as well as the involved physicians to all the information regarding the individual patient's diabetes including the UW's existing Web-based medical record system, MINDscape
2. A dynamic multimedia digital library containing an XML structured database of certified answers to questions patients, medical students, and practicing physicians ask about diabetes and its management
3. A system for matching questions posed by users with questions answered in the database
4. An information commons in which patients with diabetes can share information regarding their condition and its management
5. A security system which protects patient confidentiality

This system will serve as a testbed for patient-physician partnership systems for other conditions such as arthritis, AIDS, asthma, cancer and heart disease. The primary request for this proposal in for the one time cost of hardware and software. Once up and running, the Program for the Educational Transformation through Technology working with the eGroup will develop scale up and diffusion efforts. The 'human' side will be covered by the units using the service i.e. the folks wanting to use it for distributing content or for their educational missions.

As a starting point for the eSystem, the eGroup has determined that we will focus on the diabetes self-management system that will incorporate elements provided by different members of the group. For example, the Department of Bioengineering is in a position to contribute strongly from the concept of Distributed Diagnostics and Home Healthcare, recognizing the need to "push" to patient s information about how they can manage their diabetes and to "pull" from patient's data that could be derived from them at home. The Diabetes Self-Management Project is already well down the line in the concept of sharing data from the medical record with patients that have diabetes. The University of Washington Physicians Network is a group of providers who are often called upon to assist patients in the management their diabetes. The telehealth program is a specific opportunity for partnership and management of patients that could be well applied to diabetes. The Program for Educational Transformation through Technology is well along the way in establishing the concept of learner-driven education as well as a template-driven content formation. The Department of Medical Education is very interested in supporting the new curriculum and contributing to the development of this curriculum in the context of XML-organized digital libraries of multimedia content of relevance to the students. There is even a possibility to involve students in developing the content or in porting the content from existing materials into the new XML formats. Indeed, an online student-learning portfolio may share some attributes in common with an electronic patient record. The MyUW portal system has

made major strides in the authentication and authorization control of the entry point to the system. Finally, the information systems of the Academic Medical Center are vitally concerned with all the aspects of interactive information organization and sharing. They are particularly concerned with trying to gather together a system for accessing all the information that is of relevance to a given patient, recognizing the difficulties in having separate information systems the Washington Physicians Network, at the hospitals, and at the Sports Medicine Clinic.

Specific Elements

The Syllabus/Source

The first of these areas is a metatagged source/syllabus. By that, we mean a rich multimedia digital library arranged in XML with metatags and driven by templates to facilitate authoring and automatic metatagging. These templates are driven by authors' experience as well as by the demands of the learner or patient. An example of a template would be one describing a medical condition or a medical treatment. We suggest that all medical conditions and all medical treatments have a group of questions that may need to be answered regarding them. (for example the prognosis for the condition or complications of the treatment). By understanding the full range of questions that might be asked about a condition or treatment one can establish templates that consisted of ‘bins’ for the different content elements so that the content could be found by metatagging the ‘bin’ (prognosis) and adding the metatag of the name of the condition or the treatment (diabetes) to yield a specific resource locator (diabetes-prognosis). Creation and organization of content in this way would be facilitated by a content development support system through Catalyst.

Importantly, the information in the source/syllabus would be generic: it would be written in the third person, not attempting to relate to specific individuals. This will help avoid the implication that statements regarding a question (e.g., prognosis) would necessarily apply to a specific user (since there is no way of knowing the type or severity of diabetes that may be present).

Personal Data

A second element of the system would be a set of data relevant to an individual patient or student. In the case of a patient with diabetes, these could include the hemoglobin A1c levels or in the case of a student could contain their examination scores or their term papers or research work in progress. This personal data could be downloaded to a personal data smart card that could be kept in the wallet/purse.

AskUW, the Matchmaker

A third element of the system is a method by which the patient or the student could query the syllabus/source using questions phrased in their own words. These questions would be " matched" to a set of predetermined questions for which answers were known to exist in the Syllabus/Source. In this way, the pairing between the question and the answer would be " certified". The user would pose a question to the system that would in return suggest a series of five questions that seem to match relatively closely with the one that the user was posing. The user would then have the opportunity to pick one or more of these questions that might be of interest to her or him. On picking these questions, the user would be guided to the answer in the

Syllabus/Source and would have the opportunity not only to see the answer to the question but also to see the material that had been placed in the library adjacent to the answer to their question. As one of our colleagues once said this is a bit like going to library looking for a book and finding out that the book one really wanted was the book next to the one she was looking for. The advantage of this system is that it only provides answers to questions where the linkage between the two has been " certified". As an example, the user may ask: “I have diabetes and I want to get pregnant, should I stop taking insulin?” The matchmaker would search the Syllabus/Source and propose these five questions, each of which had a certified answer:

(1) What are the risks of insulin to the pregnant woman?
(2) What are the risks of a pregnant mother-to-be taking insulin to her as yet unborn baby?
(3) What are the possible results of stopping insulin on the person with diabetes?
(4) What is the effect of pregnancy on diabetes?
(5) What are the risks of breast-feeding by a mother taking insulin on the baby?

Information Commons

The fourth element of the system is potentially the opportunity for learner-learner or patient-patient communication so that there can be interactions and communications among individuals who are share an interest. This could consist both of a ‘bulletin board’ on which information could be posted as well as a mediated discussion or support group.

Evaluator

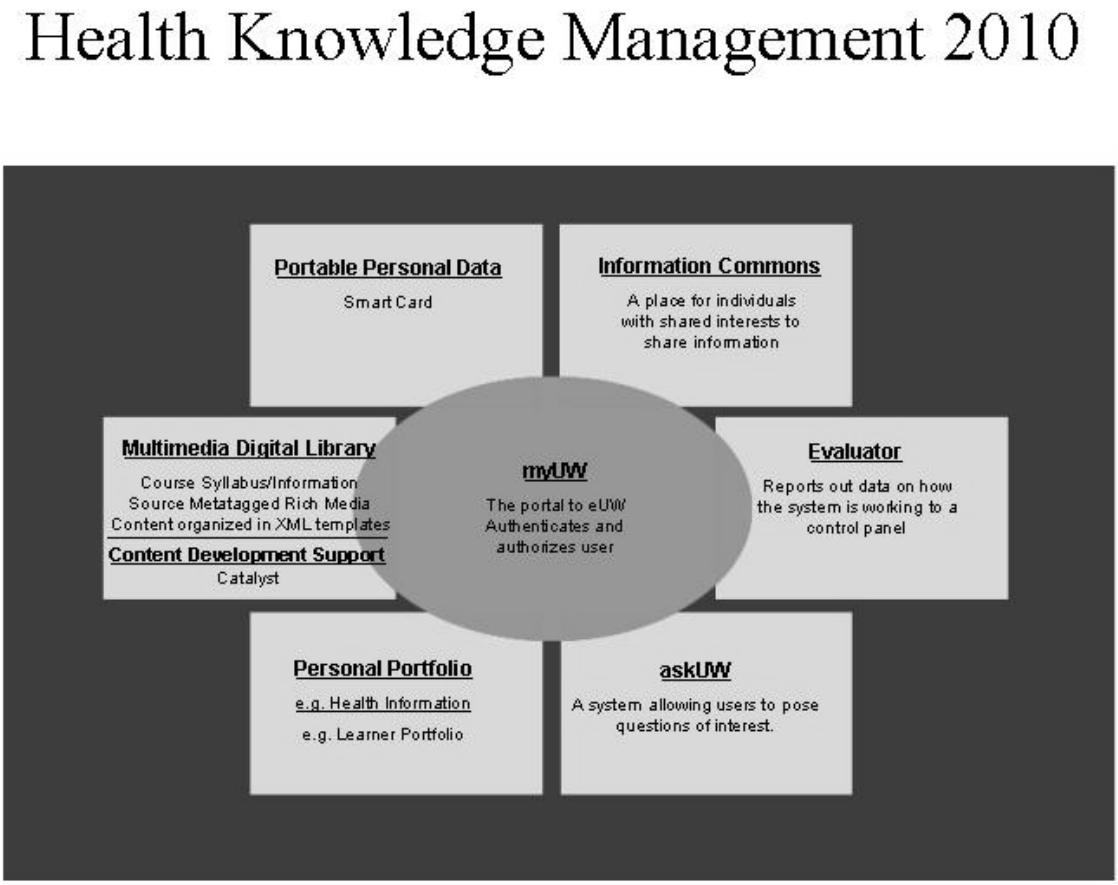
A fifth element of the system is the evaluator. This evaluator monitors the function of the system and of its individual users. For example, it would document the parts of the system that were used most often and most actively and characterize the users according to their various attributes. Likewise, it would generate a list of questions that were posted to the system - for which the matchmaking system was unable to provide answers.

MyUW Portal

The sixth element of the system is a " portal" which would enable the user to have access to the parts of the system that were relevant to them. It also enables the system to restrict or allow access to various parts of the information field. This portal will characterize the person entering (for example, patient with diabetes, student enrolled in the Introduction to Clinical Medicine Course) and allow the person entering to customize his or her view of the system. Thus we could imagine the concept of an "atrium" which would exist immediately inside the portal that would present elements familiar to users and would provide them with links to the aspects of the system that were of relevance to them and for which they have been permitted access. A final advantage of the portal is that it allows the system to restrict access, for example, by individuals coming from commercial sites or individuals who have behaved inappropriately on previous occasions.

This portal enables the University of Washington to benefit from a branding and marketing opportunity by which all individuals that had entered through the portal would recognize that they were "inside" the University of Washington. Once a individuals had "enrolled" in the University of Washington either as a learner or as a patient, they would become bonded to the University of Washington and would continue, on the one hand seek information and services

from us and, on the other hand, to partner with us in the ongoing development of educational content and templates.



People Involved

- Clare Donahue, Medical Centers Information Systems
- Harold Goldberg, Diabetes Self-Management Project
- Dan Hunt, Medical Education
- Yongmin Kim, Department of Bioengineering and Distributed Diagnosis and Home Healthcare (D2H2)
- Ed Lightfoot, C&C
- Tom Martin, Medical Centers Information Systems
- Rick Matsen, Orthopaedics and Sports Medicine
- Tom Norris, UW Physicians Network
- Fred Wolf, Medical Education Research
- Scott Macklin, PETTT

Appendix A-11. Technology Adoption

Description

Technology adoption, in the context of education, refers the processes by which educators adopt and adapt specific technologies for use in their teaching efforts. Because many educators have existing teaching styles and strategies, new technologies (and the strategies they embody) must be integrated into and/or reconciled with existing approaches. One thread of PETTT's activity is to conduct studies to understand the complexities of technology adoption, the trajectories of technology adoption, barriers and facilitators of technology adoption, and the idiosyncrasies across individuals. During the 2000-2001 academic year, we conducted one study looking at how one group of educators (those at an informational helpline) made use of an information rich Web site (the Arthritis Source). We can use lessons from this work to inform how we help educators learn about and integrate new tools.

Our activities serve PETTT goals in several direct ways:

- **Explore the interplay of technology and pedagogy in real settings:** We studied the introduction of an information-based Website into an existing educational setting by making numerous trips to the actual facility where the data gathering portion of the project was implemented. This project included collaboration with groups working in numerous disciplines including medicine, engineering, and education, both inside and outside the University of Washington.

- **Facilitate thoughtful and innovative educational technology uses:** One of the goals of our research is to encourage teaching and learning environments make effective use of technology. Our research has made claims about individual adoption factors resulting from the introduction of a Website. These claims can be extended into other cases that deal with issues of technology adoption. Our methods and claims may also be of interest to individuals concerned with effective information design, technical communication, observational analysis, and human factors.

- **Make strong connections between research, design, and practice:** In this research project, we gained knowledge about what factors affect the process of technology adoption. Such knowledge can facilitate improvements in the design of human-computer interfaces and the delivery of information through technological instruments. Our research benefits organizations both inside and outside the University of Washington community wishing to adopt new technology-based tools and those looking for ways to ease the transition of integrating Internet applications into their existing systems.

Background

Educators are introduced to and made to deal with advancements in technology perhaps now more than ever. With the introduction of the Internet as an example, the promise of improving the educational experience by bringing forth technology-based tools is becoming a common

occurrence. There exists a need to further our understanding of how best to make use of technological devices in pedagogical practice. Part of the challenge of adopting new technologies is to understand how the introduction of new methods or artifacts affects everyday work environments. In order to study the process of technology adoption, in turn supporting educators and educational activities, it behooves us to observe the proceedings first hand. By defining the factors that influence adoption in reference to actual job duties, we provide a plan of what other adopters might experience and how they may prepare to deal with the process.

Specific Activities

We acted as participant observers in discovering how Helpline volunteers used the Arthritis Source in the course of normal daily activities and we audiotaped semi-structured interviews with them. We interacted with the volunteers by asking questions about their work during the course of normal daily procedures and subsequently recorded field notes. Using descriptive research methods in the diverse setting of arthritis education helped in understanding the complex phenomena associated with the introduction of technology-based tools. Two pedagogical practices emerged from the data: staying abreast of arthritis information and providing information in a managed environment to each caller. Volunteers varied in the many different factors that have an effect on the adoption of a new technology into their pedagogical practice, but their experiences can be grouped into three categories of means, motivation, and opportunity. In the resulting analysis of adoption factors lies the basis for individual adoption parameters that can be extrapolated into helpful adoption policies and practices.

Overall Impacts

The authors of the Arthritis Source proposed that the Web site will help the volunteers in their work by educating the participants about previously unknown arthritis information and possibly providing them with an additional resource in which to refer the Helpline callers for arthritis information. In this study, PETTT helped facilitate that knowledge acquisition which could then be felt in the arthritis community at large. In addition, the Website authors received valuable feedback in the areas of design and information presentation from a knowledgeable distinct user group to improve cognitive access to the arthritis information.

This research helped to reach educators and learners in the communities outside the University and improve their teaching methods through the introduction of technology. This project also supported graduate student involvement as an opportunity to initiate qualitative and quantitative research methods.

A product of this research includes a presentation to the College of Education for the fulfillment of rigorous graduate student Research and Inquiry standards. The presentation is designed to promote valid and reliable research methodology while addressing and pursuing important education-related questions. In addition, a journal article was submitted for publication in a leading refereed periodical titled: *Integrating an Information-Intensive Website into Pedagogical Practice*.

PETTT Personnel

- Brett E. Shelton
- Jennifer Turns
- Tracey Wagner
- Rick Matsen
- Aaron Louie
- Reed Stevens
- Lori Postner
- Kurt Kors

Community Individuals

- Barbara Osen, Branch Director of Washington/Alaska Chapter, North Puget Sound Branch, Arthritis Foundation

Papers

Shelton, B. E.; Turns, J. et al. (submitted). Integrating an Information-Intensive Website into Pedagogical Practice. Submitted to *Behavior and Information Technology*.

Shelton, B. (2001). Proposal: Integrating an Information-Intensive Website into Pedagogical Practice. Technical Report PETTT-01-AS-02. Program for Educational Transformation Through Technology, University of Washington, Seattle, Washington.

Contributors to this report

Brett E. Shelton and Jennifer Turns

Appendix B-1. PETTT Team

The PETTT team includes educators, learners, researchers, and information technologists. We collaborate with faculty in a number of ways, most notably by conducting both long-term and short-term research studies of technology-based learning environments and consulting with faculty about how they can study and evaluate their own uses of educational technology.

PETTT Executive Committee

- Denice Denton (denton@engr.washington.edu)
  Dean, College of Engineering and Professor, Department of Electrical Engineering
- Louis Fox (lfox@u.washington.edu)
  Vice Provost, Office of Educational Partnerships and Learning Technologies
- Ed Lazowska (lazowska@cs.washington.edu)
  Bill and Melinda Gates Endowed Chair, Computer Science and Engineering
- Rick Matsen (matsen@u.washington.edu)
  Chair, Department of Orthopaedics & Sports Medicine

Faculty Advisors

- Cindy Atman (atman@engr.washington.edu)
  Director, Center for Engineering Learning and Teaching and Associate Professor, Industrial Engineering
- Phillip Bell (pbell@u.washington.edu)
  Assistant Professor, Cognition & Technology, Educational Psychology
- Nana Lowell (nlowell@u.washington.edu)
  Associate Director, Office of Educational Assessment
- Reed Stevens (reedstev@u.washington.edu)
  Assistant Professor, Educational Psychology
- Jennifer Turns (jturns@engr.washington.edu)
  Assistant Professor, Technical Communications

Director

- Scott Macklin (smacklin@u.washington.edu)
  Director, PETTT

Research Scientists

- Gina Cherry (gcherry@u.washington.edu)
  Research Scientist
- Janice Fournier (fournier@u.washington.edu)
  Research Scientist

Educational Technology Analysts

- Kurt Kors (kurtkors@u.washington.edu)
  Educational Technology Analyst

Technical Communications Specialist

- Tracey Wagner (tswagner@u.washington.edu)
  Technical Communications Specialist

Software Development
- Greg Bowman (gregb@u.washington.edu)
  Multimedia Designer
- Trevor Leffler (tleffler@u.washington.edu)
  Software Developer

Administration
- Vivian Dias (dias@u.washington.edu)
  Administrator

Graduate Assistants
- Kristina Liu (vrliu@u.washington.edu)
  Graduate Assistant, College of Education
- Aaron Louie (ajlouie@u.washington.edu)
  Graduate Assistant, Information School
- Lori Postner (lpostner@u.washington.edu)
  Graduate Assistant, College of Education
- Brett Shelton (bshelton@u.washington.edu)
  Graduate Assistant, College of Education
- Kristen Shuyler (kshuyler@u.washington.edu)
  Graduate Assistant, Geography

Undergraduate Students
- Nick Benson, Computer Science and Engineering
- Joseph Larson, Computer Science and Engineering
- Beth Koemans, Information School
- Alice Tanada, Applied & Comp Math Science (Statistics)

Appendix B-2. PETTT Financial Statement

P.E.T.T.T. Funded Budget 7/1/01 thru 6/30/03

Total Salaries/Benefits		$1,149,953.00
Expenses thru Sept 2001	$1,620.00	
Encumbrances	$15,750.00	
Projected Expenses 10/01-6/03	$75,000.00	
Total Operations		$92,370.00
Total Salaries/Operations		**$1,242,323.00**
Budget Carryforward 9/01		$446,470.00
Budget Allocation 01/03		$1,299,588.00
Total Budget		**$1,746,058.00**

Appendix B-3. Program Operations

At PETTT, our vision is a campus where educators and learners thoughtfully use technology to support teaching and learning. To date, we have had a variety of successes in moving toward this vision. Ultimately, the **sustainability** of our successes will be dependent on our approach to program operations.

During our second year, we continued with successful processes adopted during the first year including a monthly program operations meeting for the executive committee and the staff and use of a Web page to distribute information. During the second year, we also:

- Initiated a PETTT Advisory Council consisting of national leaders in the field of the learning sciences, faculty, students and other community stakeholders.
- Conducted a day-long retreat, attended by all members of the core PETTT team.
- Developed and initiated a formal annual evaluation procedure.
- Developed a shared hard drive so that our geographically distributed team members could have common storage.
- Created a Web-based internal bibliography management tool for sharing references.
- Formalized a technical report series protocol.
- Refined job descriptions as part of our hiring processes.

These items, in isolation, provide only a piecemeal idea of PETTT's approach to operations. In this document, we focus on describing our current approach to program operations and how our approach addresses the overarching goal of sustainability of success. In particular, we use five themes to organize aspects of our operational approach:

- Staying focused,
- Being multidisciplinary,
- Staying connected,
- Valuing the people, and
- Staying competitive.

Staying focused

In an organization such as PETTT, one of the most significant dangers is getting distracted from the main vision. This is particularly important given the scope of the PETTT vision.

Operationally, our retreat served as a primary event for helping everyone understand and stay focused. The retreat provided a forum to remind everyone of the vision and the commonalties across projects. The revised mission statement resulting from the retreat reflected input from all members of the team. As a result, the mission statement represents a shared understanding of how PETTT works toward the vision.

Our efforts to stay focused also extend far beyond a one-time retreat and development of a mission statement. We work on staying focused through regular meetings of all PETTT staff, constant sharing and discussion on the status of each project, and constant efforts to present our

work to others. Through such efforts, we have opportunities to frame and reframe our activities and to constantly verify that the direction of a project is consistent with the overall direction of PETTT.

Being multidisciplinary

PETTT is a multidisciplinary unit. This stems directly from the nature of the problems we investigate. Issues of technology in education are ultimately problems requiring insight from many different disciplines. At PETTT, we strive to ensure that the necessary multidisciplinary knowledge required of our problems is reflected in our staff and our working efforts.

Operationally, we strive to hire people with diverse backgrounds and a genuine interest in issues of education, learning, teaching, and technology. This year, we hired a new research scientist with a background in education and dance, and strong qualitative research skills. We also hired a research coordinator with a masters in geography, a background in Web design, and significant business skills. These new members complement the backgrounds of existing PETTT members (computer science, industrial engineering, cognitive science, theology, film, and education). As part of the hiring process, we have been able to refine our job descriptions to focus specifically on the tasks required in the job rather than on the specific disciplines needed. This frees us to be even more multidisciplinary.

Our commitment to being multidisciplinary is reflected not only in our hiring but also in our office space. Our offices are distributed across campus, with offices in the undergraduate library, the school of education, the college of engineering, and the school of medicine. This geographic distribution requires us to distribute meetings across campus and to maintain our links to the disciplines across campus.

Staying connected (Avoiding balkanization)

Given the geographic distribution of PETTT team members and the number of different projects in which PETTT is involved, we recognize the need to strive toward staying connected. Specifically, we need to work toward keeping PETTT members connected to each other as they work on different projects in different places.

We have taken the following steps to ensure that PETTT members stay connected to each other:

- Implementation a shared disk drive, so that team member documents can be easily shared with each other.
- Development an internal Web-based bibliography management tool so that team members can easily share the results of background research.
- Maintenance of a series of regular meetings among PETTT members, so that they would come into regular contact:
    - PETTT Core Meeting – This weekly meeting is attended by the director, the research scientists, and the educational technology analysts. We use this meeting to share status on specific projects and jointly make important decisions.
    - Program Operations Meeting – A monthly meeting attended by the executive committee, the PETTT core, and interested graduate students. In this meeting, we highlight current accomplishments and discuss strategic directions.

    - Arthritis Source Research Meeting – All PETTT team members who contribute to the largest exemplar project effort – the Arthritis Source project – attend this weekly meeting. We use this meeting to discuss specific issues in the Arthritis Source research and development efforts.
- We routinely constitute small groups to meet with potential new collaborators.
- Maintenance of our Web site, specifically as a repository of resources we have developed.

Valuing the people

The people in PETTT are one of our key assets. To fully capitalize on this value, we need to ensure that PETTT team members have opportunities to contribute their perspective. PETTT's commitment to people is reflected in at least three elements of the operating strategy:

- All meetings are open to all members of the team. Anyone has the opportunity to contribute to any project at any time.
- Our retreat provided the team members with an opportunity to influence the future directions of PETTT.
- The annual evaluation project, put into place just this year, ensures a significant opportunity for each team member to provide their perspective on the strengths, weaknesses, and challenges of PETTT.

Staying competitive

Technology changes dramatically. Ideas about how technology can support education also change rapidly. In such a context, PETTT needs to proactively take steps to ensure that the ideas and activities of PETTT are competitive.

Our overarching approach to staying competitive is to recognize ourselves as learners, and to constantly strive to continue learning. Strategies we used to continue learning included:

- Collectively, the PETTT team members attended a number of different conferences (including CHI, Aera, and EduCause)
- Our newly created Web-based bibliography tool makes it possible for us to learn from the research efforts of our colleagues.
- Our regular meetings and our retreat provides opportunities for us to learn from each others' activities.

Sustainability

Ultimately, PETTT is not only concerned with the successes in the current year, but with building a foundation that will enable future successes. Each of the elements of our operational approach contributes to the sustainability of the PETTT ideal.

Additionally, we strongly attempt to leverage efforts in order to ensure sustainability. In some cases, we leverage our own efforts, transforming one activity into another. For example, an opportunity to present some of our work to a class in health sciences became the basis for a poster at the 2001 AMIA (American Medical Informatics Association) conference. A presentation to the department of technical communications turned into a conference paper for the society of technical communications. In other cases, we attempt to leverage the work of others. For example, an informal PETTT conversation with a faculty member about technology

in their class has become the basis for a WebEd presentation by the faculty member. Frequently in our conversations with possible collaborators, we help them by putting them in touch with people doing similar work on the UW campus. Through such efforts, the idea of a PETTT vision is sustained.

Current Directions

We believe that an effective approach to operations is not something that comes easily, but rather something that is achieved through explicit attention. For example, we plan to focus energy in the upcoming year on our relationships with groups on campus that have similar missions. Our goal is to have strong, more explicit ties with groups such as Catalyst, CIDR (Center for Instructional Development and Research), CELT, and OEA. Our relationship with the Catalyst group is already becoming more concrete – through the co-development of the "promising practices" Web pages and PETTT's upcoming role in the development of new Catalyst tools (the portfolio tool and the case-based learning tool). We are constantly identifying strategies to make our operations more effective.

Appendix C-1. Dissemination

Journal Papers – Submitted

1. Lau, C.; Churchill, S.; Kim, J.; Matsen, F.A.; and Kim, Y. (submitted). Asynchronous Web-based Patient-centered Home Telemedicine System. Submitted to *IEEE Transactions on Information Technology in BioMedicine*.
2. Liu, K. and Turns, J. (in preparation). Patients' Misconceptions of Osteoarthritis. To be submitted to *Arthritis Care and Research*.
3. Shelton, B. E.; Turns, J. et al. (submitted). Integrating an Information-Intensive Website into Pedagogical Practice. Submitted to *Behavior and Information Technology*.

Conference Papers – Accepted/Published at Refereed Conferences

1. Anderson, R.; Dickey, M.; and Perkins, H. (2001). Experiences with Tutored Video Instruction for Introductory Programming Courses. *Proceedings of SIGCSE*. February 2001.
2. Stevens, R.; Cherry, G.; and Fournier, J. (2002). Video Traces: Rich Media Annotations for Learning and Teaching. *International Conference of Computer Supported Collaborative Learning: Foundations for a CSCL Community*, January 7-11, 2002, Boulder, CO.
3. Turns, J.; Liu, K. et al. (2002). Moving toward Knowledge-building Communities in Health Information Website Design. *International Conference of Computer Supported Collaborative Learning: Foundations for a CSCL Community*, January 7-11, 2002, Boulder, CO.

Conference Papers – Submitted To Refereed Conferences

1. Postner, L. and Turns, J. (submitted). Computer-Based Assessment of Students' Knowledge about Variables: Design and Results. The *33rd Technical Symposium on Computer Science Education*, February 26-March 2, 2002, Kentucky.
2. Turns, J. and Wagner, T. (submitted). Listening to the Learners: A Case Study in Health Information Website Design. *2001 Annual Conference of the Society of Technical Communication*, Nashville, TN.
3. VanDeGrift, T. and Anderson, R. (submitted) Classroom Assessment Tools as Discussion Frameworks in CS 1. The *33rd Technical Symposium on Computer Science Education*, February 26 - March 2, 2002, Kentucky.

Conference Papers – Presented at the Conference

1. Macklin, S. (2000). Interfacing: Perspectives on Teaching and Learning with Technology. Paper presented at the Collaboration for the Advancement of College Teaching & Learning virtual conference "Home on the Web: The Challenges and Opportunities of Online Learning Communities," Minneapolis: MN.
2. Macklin, S. and Lewis, T. (2000). A Catalyst for Collaboration: Supporting Technology in Teaching through Partnerships. Presentation given at National Educause Conference.

Book Chapters

1. Donovan, M. and Macklin, S. (2000). The Catalyst Project: Supporting Faculty Uses of the Web...with the Web. In *E-Learning: Expanding the Training Classroom through Technology*, Rector Duncan and Associates Inc., Austin, Texas.

Technical reports

1. Turns, J. and Liu, K. (2000). Arthritis Source Online Survey Results. Technical Report PETTT-00-AS-01. Program for Educational Transformation Through Technology, University of Washington, Seattle, Washington.
2. Turns, J. and Wagner, T. (2001). Continuing Medical Education: Observations of CME Course on Feb. 8 and 9, 2001. Technical Report PETTT-01-PT-01. Program for Educational Transformation Through Technology, University of Washington, Seattle, Washington.
3. Macklin, S. (2001). Interfacing: Perspectives on Teaching and Learning with Technology. Technical Report PETTT-01-PT-02. Program for Educational Transformation Through Technology, University of Washington, Seattle, Washington.
4. Liu, K.; Turns, J.; and Wagner, T. (2001). Understanding Users of a Medical Information Website: A Phone Interview Study of Arthritis Source Users. Technical Report PETTT-01-AS-01. Program for Educational Transformation Through Technology, University of Washington, Seattle, Washington.
5. Shelton, B. (2001). Proposal: Integrating an Information-Intensive Website into Pedagogical Practice. Technical Report PETTT-01-AS-02. Program for Educational Transformation Through Technology, University of Washington, Seattle, Washington.
6. Louie, A.J.; Burghardt, J.S.; Warren, R.; Macklin, S.; and Matsen, F.A. (2001). Improving Search Engine Position of Internet Educational Materials: Design Heuristics and Indexing Methods. Technical Report PETTT-01-AS-03. Program for Educational Transformation Through Technology, University of Washington, Seattle, Washington.
7. Postner, L. (2001). Computer Science Education Research on Programming: What We Know and How We Know It. Technical Report PETTT-01-FA-01. Program for Educational Transformation Through Technology, University of Washington, Seattle, Washington.
8. Turns, J. (2001). Tutored Video Instruction Work at the University of Washington: Bibliography. Technical Report PETTT-01-TVI-01. Program for Educational Transformation Through Technology, University of Washington, Seattle, Washington.

Presentations

1. Lewis, T. and Macklin, S. (2001). Faculty Voices & Educational Technology: Shaping Effective Student-Centered Learning. Presentation for the 88th Annual Meeting of the Association of American Colleges& Universities.
2. Louie, A; Macklin, S.; and Warren, R. (2001). Design Heuristics for Creating Tailored Patient Education Materials for the Web. Presentation to the Selected Topics in Health Informatics group. November 2000.

3. Macklin, S. (2000). Bringing Technology into the Service of Teaching and Learning. Keynote Presentation to the Seattle Society for Information Management (SIM), November 2000, Seattle: WA.

4. Macklin, S. (2000). Faculty Support for Teaching with Technology. Keynote Presentation at Project JSTOR's conference, Creating Partnerships, Creating Scholarship: Strengthening Research, Teaching and Learning with Effective Use of Electronic Resources. October 27, 2000, Minneapolis: MN.
5. Macklin, S. and Matsen, R. (2001). Health Knowledge Management 2010. Presentation to PETTT Board of Directors and UW Medical Affairs. Oct. 24, 2001.
6. Shelton, B. (2001). Integrating an Information-Intensive Website into Pedagogical Practice. Presentation to the College of Education, May 2001.
7. Stevens, R. Video Traces: Media Rich Annotations for Learning and Teaching. Presentation at PETTT Spring Symposium 2001: Locating the Learner: Educational Uses of Technology and Rich Media. May 24, 2001.
8. Turns, J., Wagner, T., Liu, K. (2001). Qx → Qc → Ac: Questions from Phone Interview. Presentation to Arthritis Source Research Group. June 2001.
9. Turns, J. (2001). Listening to the Learner: Strategies, Examples, and Implications from Research on a Medical Information Website. Presentation to the Department of Technical Communication, March 2001.
10. Warren, R., Louie, A., and Matsen, R. (2001). Design Heuristics for "The Arthritis Source" Web Site: Improving Search Engine Position and Processing User Feedback for Quality Improvement. Presentation to be given at the AMIA National Conference. November 2001.

Appendix C-2. Proposals

Funded

1. Portfolio Tool. UW Student Technology Fee: $90,000. PETTT: $30,000.
    a. Tom Lewis, Educational Technology Development Group
    b. Scott Macklin, PETTT
2. Rich Media Annotations for Teaching and Learning. Center for Innovative Learning Technologies (CILT) Seed Grant: $10,000.
    a. Reed Stevens, UW College of Education
    b. UC Berkeley
    c. University of Missouri-St. Louis
    d. McGill University/TeleLearning NCE
    e. UCSD
    f. Arizona State University
    g. Carnegie Foundation
3. An Engineering Design Expertise Continuum: Filling It in and Linking It to Education Practice. National Science Foundation – Research on Learning and Education (NSF-ROLE): $500,000.
    a. Cindy Atman
    b. Robin Adams
    c. Jennifer Turns

Under Review

1. The Diabetes Source: An Enduring, Enhanceable, and Scalable Web-Based Information Dissemination System. Seattle Foundation Medical Grant: $25,000.
    a. Harold Goldberg, Diabetes Self-Management Project
    b. Dan Hunt, Medical Education
    c. Yongmin Kim, Dept. of Bioengineering and Distributed Diagnosis and Home Healthcare (D2H2)
    d. Ed Lightfoot, C&C
    e. Scott Macklin, PETTT
    f. Tom Martin, Medical Centers Information Systems
    g. Rick Matsen, Orthopaedics and Sports Medicine
    h. Tom Norris, UW Physicians Network
    i. Fred Wolf, Medical Education Research

2. Development of Computer-based Instructional Aids to Teach Fundamentals of Life Sciences to Engineers. Whitaker Foundation: $1,000,000.
    a. Mary E. Lidstrom, Engineering and Microbiology, New Initiatives in Engineering
    b. Cynthia J. Atman, Industrial Engineering, Center for Engineering Learning and Teaching
    c. Michael J. Campion, College of Engineering EDGE program (Education at a Distance for Growth and Excellence)

Declined

1. Developing a User-Centered Digital Library to Support Computer Science Education. National Science Foundation - Digital Libraries Initiative (NSF-NSDL): $776,049.
    a. Jennifer Turns
    b. Cindy Atman
    c. Richard Anderson
    d. Gina Cherry
2. Tutored Video Instruction for Introductory Computer Programming. National Science Foundation – Instruction Technology Research (NSF-ITR): $500,000.
    a. Richard Anderson
    b. Jennifer Turns
3. Learning Anyplace Anytime (LAAP). U.S. Department of Education: $1,400,000.
    a. David Szatmary, UWEO
    b. Robert Franza, UW Cell Systems Institute
    c. Steve Kerr, UW College of Education
    d. Scott Macklin, PETTT
4. WebDAT: A Web-Based Data Collection and Analysis Tool. NorthWest Academic Computing Consortium (NWACC): $10,000.
    a. George Bridges, Office of Undergraduate Education
    b. Mark Alway, Educational Technology Development Group
    c. Scott Macklin, PETTT

Appendix C-3. Campus Impact

In its second year, PETTT efforts involved over 100 people in addition to the PETTT staff. These people represent over 50 units at the UW, including 10 of 17 schools (or 59%) and 17 of 142 departments (or 12%). These 150 people also include representatives from 11 units external to the university and 9 community colleges in the UW region.

The tables on the next three pages provide details on the persons and groups with whom PETTT worked during the 2000-2001 year. The following tables are provided:

- Table 1: Groups with whom PETTT worked during the reporting year
- Table 2: People with whom PETTT interacted during the reporting year

These numbers take into account those with whom we have some form of extended, personal contact. This includes educators, designers, developers, researchers, and graduate students. The educators range from those working with a specific technology to those simply learning more about technology in education. The developers include those who are actively working on our tools and those who are sharing their expertise with us. Specifically, we may have interacted through one or more meetings to discuss activities in a class, a prolonged collaboration to conduct research in a classroom, a collaborative effort to design a study, joint participation in a "sharing" session where ideas and information are exchanged, or a collaboration to create some technology.

These numbers significantly underestimate the number of people touched by PETTT efforts. A comprehensive account of all of the people impacted by PETTT activities would need to take into account:

- the number of people who attended the Spring Fling,
- the number of people participating in the faculty survey,
- the number of people who attended WebEd meetings last year,
- the number of people who have received the new newsletter *OnTech News*,
- the number of students in classes impacted by our efforts, and
- the number of people who learn from our published work.

We plan to collect these numbers during the upcoming year.

The numbers cited here speak to one fundamental responsibility of PETTT. To be successful, PETTT's activities must ultimately be **relevant to the entire university** -- not just one subset of the educators on campus. To ensure relevance, PETTT needs, above all, to be working with a wide variety of departments representing a broad sample of the types of educational activity occurring across the campus. Additionally, to make the work relevant, PETTT needs to listen to, learn from, and leverage the knowledge and insights available in other groups across campus.

The large number of people, units, departments, schools, and outside organizations testifies to PETTT's commitment to strive toward university wide relevance.

Table 1. Groups with whom PETTT worked during the reporting year

UW Units	Libraries
School Level Collaborations	Libraries, Science Libraries
Business Administration	Medical and Family Education
School of Medicine	Medical Centers Information Systems
School of Nursing	Medical Education Research
Information School	Office of Educational Assessment
Daniel J. Evans School of Public Affairs	Office of Educational Outreach
College of Education	Office of Educational Partnerships
College of Arts and Sciences	Office of Educational Partnerships and Learning
Forest Resources	Technologies
Departments	Office of Undergraduate Education
Architecture	Outreach
Bioengineering	Patient and Family Education Services
Computer Science & Engineering	Provost Office
Construction Management	Puget Sound Center for Teaching, Learning, and
Dance	Technology
Drama	UW Bothell
Electrical Engineering	UW Physicians Network
Family Medicine	UWTV
Geography	Community College Units
Mechanical Engineering	Heritage College
Medical Education	Highline Community College
Music	Seattle Community Colleges
Orthopaedics and Sports Medicine	Shoreline Community College
Physics	Wenatchee Valley College
Psychiatry and Behavioral Sciences	North Seattle Community College
Statistics	Central Washington
Technical Communication	Centralia Community College
Centers on Campus	Green River Community College
Center for Ecogenetics and Environmental Health	**Units External to the University**
Center for Engineering Learning and Teaching	American Juvenile Arthritis Organization
Center for Environment, Education, and Design Studies	Arthritis Foundation
(CEEDS)	Bellevue Art Museum
Center for Innovative Learning Technologies	St. Louis Science Center
Center for Instructional Development and Research	Red Feather Development Group, Bellevue
Center for Statistics and the Social Sciences	Pacific Science Center
Center for Teaching, Learning and Technology	Microsoft
Other UW Units	New Jersey Institute of Technology
Bothell Faculty Development	Northern Cheyenne Reservation, Montana
Computing and Communications	University of California, Berkeley
Continuing Medical Education	Omak Reservation (?)
Education at a Distance for Growth and Excellence	Lawrence Hall of Science
Educational Technology Development Group	**Schools at UW**
English as a Second Language	Business School College of Architecture and Urban
Experimental Education Unit	Planning College of Arts and Sciences College of
General Internal Medicine	Education College of Engineering College of Forest
Health Science Library	Resources Daniel J. Evans School of Public Affairs
Health Sciences	Information School School of Medicine School of
Health Sciences Center for Educational Resources	Nursing
Interdisciplinary Arts & Sciences, UW Bothell,	

Table 2: People with Whom PETTT interacted during the Reporting Year

Person	Affiliation	Project
A.J Brush	Computer Science & Engineering	Spring Fling
Alice Tanada	Statistics	Arthritis Source
Amy Philipson	UWTV	Spring Fling
Angela Linse	Center for Engineering Learning and Teaching	TVI
Barbara Goldner	North Seattle Community College	TVI
Barbara Olsen	Arthritis Foundation	Arthritis Source
Basia Belza	Nursing	Arthritis Source
Bill Corigan	Office of Educational Outreach	Spring Fling
Bob Crestionson	Highline Community College	TVI
Brett Shelton	College of Education	Arthritis Source
Brian Tjaden	Computer Science & Engineering	Facet-based assessment
Carla Portocarrero	Computer Science & Engineering	Facet-based Assessment
Catharine Reznicek	Puget Sound Center for Teaching, Learning, and Tech.	Web-Ed
Cesanne Garcia	Patient and Family Education Services	Arthritis Source
Christina Eichbaum	Architecture	CEEDS
Christine Goodheart	Office of Educational Partnerships and Learning Tech.	Video Traces
Chuck Henry	Forest Resources	Video Traces
Cindy Atman	PETTT	Facet-based Assessment
Cliff Solomon	School of Nursing	Spring Fling, Web-Ed
Cynthia Fugate	UW Bothell	Spring Fling
Dan Hunt	Medical Education	E-group
Daniel Kao	Central Washington	TVI
Dave Bargeron	Microsoft	Spring Fling
David Riley	Construction Management	Video Traces
David Taylor	Pacific Science Center	Video Traces
Debra Friedman	Provost Office	Spring Fling
Dennis Shaffer	North Seattle Community College	TVI
Don Wolfe	Center for Instructional Development and Research	Faculty Survey
Doug Shaad	Health Sciences	Spring Fling
Ed Lazowska	Computer Science & Engineering	TVI, Spring Fling, E-group
Fran Kwok	UWTV	TVI
Fred Videon	Computer Science & Engineering	TVI
Fred Wolf	Medical Education	Faculty Survey, E-group
George Bridges	Office of Undergraduate Education	Spring Fling, Faculty Survey
Greg Schmale	Orthopaedics and Sports Medicine	Video Traces
Greg Zick	Electrical Engineering	Spring Fling
Hal Perkins	Computer Science & Engineering	TVI, Facet-based assessment
Harold Goldberg	General Internal Medicine	E-group
Jan Spyridakis	Technical Communication	Arthritis Source
Jaime Diaz	Psychology	MRAS Experiments
Janet Hannan	Green River Community College	TVI
Joe Polmon	Community College	Video Traces
Jonathan Sharpe	Center for Ecogenetics and Environmental Health	Web-Ed
Joseph Larson	Computer Science & Engineering	Facet-based Assessment
Judy Ramey	Technical Communication	Spring Fling
Julie Stein	College of Arts and Sciences	Faculty Survey
Kit Arbuckle	Wenatchee Valley College	TVI
Kody Janey	Libraries	Spring Fling
Kristina Liu	College of Education	Arthritis Source
Lina Garcia	Architecture	CEEDS
Lori Postner	Education	Facet-based assessment

Louis Fox	Office of Educational Partnerships	Spring Fling
Maria Simpson	Dance	Video Traces
Mark Alway	Educational Technology Development Group	Spring Fling
Mark Scott	Office of Educational Outreach	Web-Ed
Martin Dickey	Computer Science & Engineering	TVI, Facet-based assessment
Masashi Kato	Technical Communication	Spring Fling
Matt Weaver	Shoreline Community College	TVI
Melissa Albin	Computer Science & Engineering	TVI
Michael Campion	Education at a Distance for Growth and Excellence	Web-Ed, Exploratory Collab.
Michael Goldberg	Interdisciplinary Arts & Sciences, UW Bothell,	Video Traces
Mike Wellings	UWTV	Spring Fling
Nana Lowell	Office of Educational Assessment	Faculty Survey
Nancy Weiner	Health Sciences Center for Educational Resources	Web-Ed
Nick Benson	Computer Science & Engineering	Undergraduate Researcher
Oren Sreebny	Computing and Communications	Spring Fling
Pat Wasley	College of Education	Spring Fling, Faculty Survey
Penelope Karovsky	Experimental Education Unit	Web-Ed
Rebecca Sliger	Highline Community College	TVI
Richard Anderson	Computer Science & Engineering	TVI
Richard Ells	Computing and Communications	Web-Ed
Richard Karpen	Music	Video Traces
Rick Rose	School of Medicine	Arthritis Source
Ricki Goldman-Segall	New Jersey Institute of Technology	Exploratory Collaboration
Rob Kitsos	Drama	Video Traces
Rob Prieto	Computer Science & Engineering	TVI
Robert Ozuna	Outreach	TVI
Rogers Hall	Berkeley	Video Traces
Ryan Landvoy	Heritage College	TVI
Sara Kim	Medical and Family Education	Exploratory Collab, Video Traces
Sergio Palleroni	Architecture	Video Traces
Sharon Sutton	Center for Envt, Education, and Design Studies	CEEDS
Stephen Kerr	College of Education	Web-Ed
Steve Graham	College of Arts and Sciences	Faculty Survey
Steve Hiller	Libraries, Science Libraries	Faculty Survey
Steve Tanimoto	Computer Science & Engineering	Exploratory Collab, Spring Fling,
Steve Wolfman	Computer Science & Engineering	Facet-based assessment
Stuart Sutton	Information School	Spring Fling, Arthritis Source
Tammy VanDeGrift	Computer Science & Engineering	TVI
Tin Lam	Architecture	CEEDS
Tom Lewis	Center for Teaching, Learning and Technology	Spring Fling, Web-Ed
Tom Martin	Medical Centers Information Systems	E-group
Tom Norris	UW Physicians Network	E-group
Tino Mantella	Arthritis Foundation (CEO)	Arthritis Source
Trevor Leffler	Center for Teaching, Learning and Technology	Arthritis Source
Yongmin Kim	Bioengineering	E-group

Appendix C-4. Testimonials

- "The initiation of the PETTT program (Program for Educational Transformation through Technology) has encouraged the development of new ways to use technology to enhance student learning. It is imperative that these programs be allowed to grow and adapt to the changing needs of the students and faculty, since the continuing efforts of these programs will ensure our continued leadership role in the use of technology in teaching and learning.
  - The A&S Report on Enhancing Student Learning (Page 21) http://www.artsci.washington.edu/asreports/List.htm

- The strategic plan for the College of Education includes a specific commitment to infuse technology through all programs in order to model uses and practices that students can learn and effectively apply in their respective fields. This in turn requires helping faculty to more fully integrate technology in its own teaching and research. To fulfill this commitment over the next several years, the College looks forward to continuing to draw upon the excellent assistance provided by the UIF funded Program for the Educational Transformation through Technology (PETTT).
  - Pat Wasely, Dean College of Education

- "The Arthritis Foundation, North Puget Sound Branch in Bellingham is very proud to have had the opportunity of working with the PETTT team. It was a very rewarding learning experience for all the Helpline volunteers and staff. The Arthritis Source is now a valuable tool used daily. For many volunteers the Arthritis Source was an introduction to Web browsing. It is now our standard place to search for answers to difficult arthritis-related questions. We appreciate the reliability and authority of the Source. We find it extremely helpful to be able to ask questions by email.
  - Barbara Osen, Branch Director Arthritis Foundation, Washington/Alaska Chapter

- For several years, the Department of Computer Science & Engineering (CSE) has taught CSE490CA, an interdisciplinary capstone design course in which students from CSE, art, music, architecture, and other fields design and digitally produce a computer animated short in a quarter. PETTT's Scott Macklin saw an opportunity to use the course as the basis for a partnership in a nascent digital animation center with CSE, the UW Libraries, and UW Educational Partnerships. Through a generous sharing of space and information specialists, the Odegaard Undergraduate Library, under the direction of Jill McKinstry, made it possible for CSE490A to further improve this part of CSE's state-of-the-art digital animation curriculum. PETTT's vision was essential in putting the UW Libraries

together with CSE, with the animation course only the first of several shared initiatives that are underway.

– David Notkin, Chair CSE

- In this internship, I was able to work with people from a number of different departments across campus that I would have otherwise not had the opportunity to get to know. I worked with faculty from various disciplines, researchers, fellow students and software developers. In this way, it gave me valuable real world experience concerning interfacing with people from many different occupations and backgrounds.

  While I was at PETTT, I also had a chance to sit in on the *Locating the Learner* conference. In the past I have not known much about or been interested in the field of Education, but this conference presented some interesting ideas and research. I went to a presentation by a professor from the New Jersey Institute of Technology and a presentation by a University of Washington researcher. Both were very interesting and entertaining because both used both audio and video in their presentations.

  – Josef Larson, Student Intern

The recent report by the Web-based Education Commission to the President and Congress pulls into focus the need to…establish a pedagogical base for the effective use of Internet learning. We need a vastly expanded, revitalized, and reconfigured educational research, development, and innovation program, one built on a deeper understanding of how people learn, and how new tools support and assess learning gains.
Bob Kerrey, et al (2001), *The Power of the Internet for Learning: Moving from Promise to Practice,* Report of the Web-based Education Commission to the President and Congress of the United States
http://www.ed.gov/offices/AC/WBEC/FinalReport/WBECReport.pdf.