

Program for Educational Transformation Through Technology (PETTT)

Executive Summary

The Program for Educational Transformation Through Technology (PETTT) will optimize the effectiveness of the University of Washington's faculty, and thus of the institution itself, by creating a campus framework to promote the *exploration, development, assessment, and dissemination* of next-generation *technologies and strategies for teaching and learning*. PETTT will help UW faculty to optimize their creativity in meeting the ever-expanding opportunities in education – to provide more quality information, in a better way, to more people of diverse backgrounds in widely dispersed locations.

PETTT is based upon the following principles:

- Optimizing the effectiveness of the faculty is one of the great academic challenges of the coming century, as universities seek to meet ever greater and more diverse responsibilities with limited resources
- Educational technology has the potential to contribute enormously to meeting this challenge, significantly enhancing both teaching and learning
- In order to achieve this promise, there must be an intimate coupling between the evolution of educational technology and the evolution of educational practice and educational science: each must inform the other, in a continuous cycle
- The results – innovative and effective tools and techniques from the technological and pedagogical realms – must not reside in centralized organizations; they must be placed directly in the hands of faculty, where they can be used and evolved every day
- The window of opportunity is about to burst open. Educational technology, as with all of information technology, progresses at an exponential pace; like lily pads on a pond, or the Internet, it doubles away largely unnoticed, then suddenly becomes ubiquitous

Driven by these principles, PETTT embodies the following approaches:

- The PETTT team includes educators, technologists, educational scientists, and administrators – individuals who can evolve the technology, evolve the pedagogy, put both into practice, evaluate the efficacy, and widely disseminate the results
- PETTT will be driven by a sequence of “exemplar projects” chosen over time to explore the full spectrum of the University's missions along three axes: types of learners/audiences, types of learning settings, and types of learning objectives
- Using these projects as testbeds, we will focus on the design, development, and assessment of technology-infused pedagogical strategies that facilitate learning and transform the educational process
- As well, we will focus on the identification, evaluation, and integration of software resources that ease the task of creating appropriate materials; we will determine their effectiveness as instruments of educational change, and develop approaches that make it as easy as possible to use these resources to catalyze new instructional practices
- Our approaches to assessment and dissemination will be driven by the diverse experiences and partnerships of UWired, Computing & Communications, the Office of Educational Assessment, the Center for Engineering Learning and Teaching, the University Libraries, and the College of Education
- A team of peer reviewers will conduct an ongoing meta-analysis of the effectiveness of PETTT in meeting its triple goals of innovation, evaluation, and dissemination

PETTT will benefit the University of Washington in six important ways:

- PETTT will be an enduring program dedicated to promoting the exploration, development, assessment, and dissemination of next-generation technologies and strategies for teaching and learning, across the full spectrum of the University's missions
- It will gain leverage by linking separate campus groups with common interests and diverse skills and experiences into a collaborative partnership
- It will provide all faculty with a continuously evolving package of easy-to-use software solutions integrated with effective educational strategies, enabling these faculty to better meet their diverse and increasing educational responsibilities
- It will optimize the educational creativity and efficiency of our faculty, and increase the return on our investments in education
- It will increase the opportunities for the University to provide value to the citizens of the State of Washington
- It will increase the stature of the University in the domain of the science of learning

Our pre-proposal is attached as an appendix, and is not recapitulated here. For illustrative examples, we refer you to our web site, <http://www.PETTT.washington.edu>.

Overview of the Program for Educational Transformation Through Technology (PETTT)

- **The Opportunity.** The University of Washington has now a special opportunity to build on its considerable strengths as a local, regional, national, and global educational institution. Never before have we had the need to reach so many different learners, in so many different locations, with such diverse educational offerings. Never before have information technology and new educational strategies offered such promise for catalyzing the attainment of our diverse educational visions. Never before has there been such a variance in our faculty members' working familiarity with modern educational technologies. And never before has there been such a need for rigorous evaluation of the many tools and strategies that are rapidly and continually becoming available.
- **The Challenge.** Now is the time to ask, "In what ways can the progressive innovations in information technology enhance the outcome of our educational efforts across the full spectrum of the University's missions?" We observe that science and industry are exponentially improving the methods by which information can be collected, assembled, edited, upgraded, archived, displayed, distributed, and accessed interactively. We propose that if progressive educational strategies are evolved in concert with these evolving technologies, learners will benefit from increasingly engaging methods by which they can gain knowledge through experiential learning.
- **The Program.** The Program for Educational Transformation Through Technology will link campus groups with common interests and diverse skills and experiences into a collaborative unit. The team will use ongoing exemplar projects as testbeds to drive a continuous process of exploration, development, assessment, and deployment of next-generation technologies and strategies for teaching and learning. Three such projects of the PETTT team (the Arthritis Source, Tutored Video Instruction, and the Interactive Encyclopaedia of Pacific Northwest Forests) are currently in different parts of their developmental life cycle. Additional demonstration projects will be selected to help the Program extend to explore diverse learning objectives, types of learning, and types of learners/audiences.
- **Dissemination.** As educational strategies and technologies mature in terms of their demonstrated effectiveness, these resources will be disseminated to the UW faculty at large and to the many other educators with whom we are in partnership. Our aim is to provide a continuously evolving package of easy-to-use integrated software solutions and effective educational strategies developed from our ongoing research that will enable faculty to meet their diverse educational responsibilities with creativity, innovation and efficiency.
- **On-going review.** We will review each project against defined evaluative criteria. A meta analysis team will rigorously review the Program as whole, assuring that it remains focused on its goals and objectives.
- **Leverage.** Substantial opportunities exist for leveraging this UIF project through educational research grants, partnership with other institutions, and commercialization.
- **The proposal.** The proposal that follows, our website (<http://www.PETTT.washington.edu>.) and the appendix highlight some of the key aspects of the Program for Educational Transformation Through Technology.

Demo #1: The Arthritis Source: just-in-time interactive information for a diverse set of learners

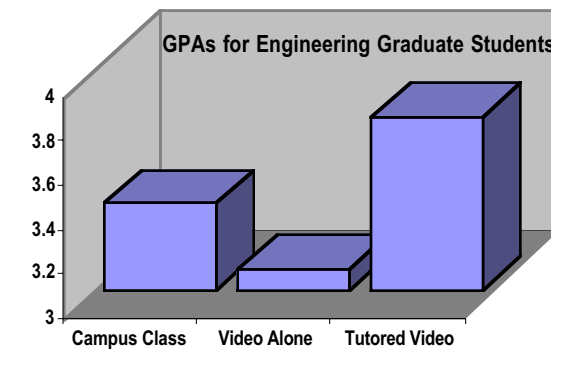
Arthritis is a life-long, variably progressive condition – now the most common cause of disability in the United States. Arthritis affects over 600,000 individuals in Washington; many live in isolated rural settings, many are of American native ethnicity, and many are essentially housebound by their physical limitations. Affected individuals need facilitated access to current, reliable information regarding the expected manifestations of their type of arthritis as well as the physical therapy, medications, surgery, support groups, and legal resources that can help them manage their condition – ideally the patient becomes the 'health maintenance organization'. Because of the chronicity of arthritis and the geographical/physical restrictions impairing repeated visits to the doctor's office – the ideal place for these patients to access information is in their own home. Interestingly, the range of information needed by these individuals with arthritis is virtually the same as that needed by medical students, nursing students, physical therapy students, physician and nurse practitioners, families and the public.

In response to this educational opportunity, the Washington State Chapter of the Arthritis Foundation and faculty from the Schools of Medicine and Nursing assembled the Arthritis Source, a durable and enhanceable interactive information program for all individuals needing to know about arthritis. The award-winning Arthritis Source remains in active use five years after it took form: faculty use it in their course teaching, individuals from around the world access the Web site (www.orthop.washington.edu/) over 300,000 times a month, the Arthritis Foundation has distributed a multiplatform CD version, and each day many patients and families at the UW Bone and Joint Center access the Source using a touch-screen kiosk.

In spite of this success, substantial problems exist with the Arthritis Source, problems which will be specific targets of the Program for Educational Transformation Through Technology: ••over half of the effort necessary to create it concerned technical details rather than content, ••as a result, other faculty are unwilling to construct similar programs because of the big fiddle, ••the outdated technology used creates major barriers to our enhancing/updating the Source, ••Web search engines have difficulty finding the Source among the ads for arthritis remedies, •• the Arthritis Foundation Help Line is not linked to the Arthritis Source in a functional way, •• we have not enabled on-line tutoring or learner-learner interactivity for users of the Source, ••we have not been able to measure the educational effectiveness of the Arthritis Source

Demo #2: Tutored digital video: Transforming UW's relationship with our partner institutions

CSE 142/143 is an ambitious two-quarter introductory course sequence with more than 2,500 enrollments annually on the UW campus. Despite extensive efforts at sharing curricula, many community college courses don't measure up. The result: 2-year students with inadequate preparation, and transfer students who must repeat courses. A number of years ago, Jim Gibbons, recently retired as Dean of Engineering at Stanford, invented the concept of "tutored video instruction" (TVI) to allow students at Hewlett-Packard facilities outside of the Bay Area to obtain Stanford EE Masters degrees. In TVI, small groups of students meet to watch videotapes of the lecture. The group is convened by a "tutor," whose job is to stop the tape whenever a question arises and guide the students towards a solution. The stunning result: students in the tutored video setting outperform students in the live lecture (GPA 3.8 vs. 3.4)! Students who watch the video on their own do far worse.



This year, UW Computer Science & Engineering has been employing tutored digital video (audio/video and transparencies delivered over the Internet) to offer CSE 142 and CSE 143 at several community colleges and (for control purposes) to several hundred UW students. Gibbons and colleagues have participated both in planning and in evaluation. This experiment utilizes cutting-edge web technology, and involves an entirely new (except for Gibbons' previous experiments) educational paradigm.

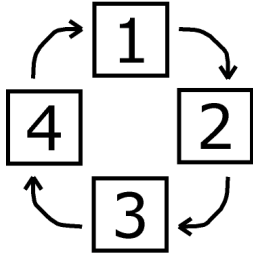
If this experiment is successful, it has the potential to transform introductory Computer Science education at the state's 32 community and technical colleges. The implications are more profound even than this, though. Should our on-campus students be taught in this way, rather than in lecture sections? (Obviously, transforming teaching and learning on our own campus is a top priority!) Can upper-division courses be offered at remote sites in this way, addressing the state's IT workforce shortage in a scaleable way? Can other disciplines take advantage of this technology and pedagogy? The Program for Educational Transformation Through Technology will enable us to aggressively pursue all of these threads – the tools, the procedures, the pedagogy, the evaluation, the dissemination.

Demo#3: The Interactive Encyclopedia of Pacific Northwest Forests

Transforming a college through a unifying initiative. The College of Forest Resources is undertaking a four-part strategy that will place access to forest-based natural resources educational material into the most convenient and useful forms for all potential audiences served by the University of Washington. First we will conduct distance learning utilizing the K-20 Network in order to bring graduate level courses to a wider audience of students and professionals. Second, we will seek opportunities to work with faculty in two-year institutions, particularly in under-served areas, to better prepare students for further education in natural resources curricula. Third, we will augment the available educational materials at the two-year institutions to allow for greater integration of natural sciences topics across multiple disciplines. Fourth, we will fortify Parts 1-3 of this strategy by establishing and maintaining The Interactive Encyclopedia of Pacific Northwest Forests (IEPNF), a science-based clearinghouse of knowledge on the Pacific Northwest's forest-based natural resources. The IEPNF provides compelling examples of experiential learning and on-line experimentation. Employing state-of-the art educational and communication technology, with an interactive format, it will reside on the Internet at a University of Washington designated URL. The IEPNF will serve the research needs of a broad base of persons - grassroots to global, K-12 to think-tank - who wish to learn more about the natural environment in our unique region. Examples of IEPNF capabilities include simple word and concept definitions supported by images, video and animation; dichotomous keys and color images to identify regional flora and fauna; the ability to visit virtual ecosystems visually and analytically; to run computer-based models focused on species population trends; to see and hear the results of forestry research; to tap into regional graphic information systems. The IEPNF will integrate recognized learning styles, feedback mechanisms for impact assessment and a continuous quality program to its content and delivery modes. Development and revisions will be the result of a design team to include a project coordinator, a research assistant with expertise in web-based information technology, CFR faculty support (summer and/or release), and a contact group outside the University representing IEPNF user groups. The IEPNF will demonstrate the leverage afforded by Program for Educational Transformation Through Technology.

Research on learning and the design of effective educational technologies

An emerging perspective in the learning sciences involves an iterative process of research on learning with the design of integrated pedagogical practices and technological tools (Brown, 1992; Collins, 1992; diSessa, 1991; Linn, 1990). As we conceive of applying this in the proposed work, there are four basic phases:



- Perform studies in real settings to investigate what is learned, who learns, and how it happens,
- which in turn inform the design of appropriate tools.
- These new tools are integrated into educational settings,
- in which new studies are conducted to understand how these new tools have affected learning and learners.

In the PETTT project, we propose to tailor ongoing cycles of this type of research to the particular goals of the University of Washington and its diverse audiences of learners. To illustrate our approach and to give a broader sense of the overall logic of our studies of learning, what follows maps this four-phase cycle onto the proposed exemplar projects. Each exemplar project represents a different stage in the "lifecycle" of an educational technology project. We plan to take advantage of these differences to maximize what we learn and use this knowledge to inform our design of innovative learning environments.

An example of our research cycle

(1) Consider first the "tutored video instruction" project. Clearly, the combination of technology and pedagogical activities has been successful, both elsewhere and at the UW, in particular circumstances as documented by Gibbons (citation). Much less clear is which features of the learning environment are critical to its success. *Our question is this: what exactly do tutors and students do with the videos that allow students to perform better than their peers who participate in live lectures?* In short, the question calls for a detailed case study of how technology-mediated teaching and learning happen in these settings. It is important also to note that such studies can do more than help us identify why existing projects work. They can also show us where improvements should be made and can discover unexpected benefits of tutored video that are not represented by higher student grades, such as the capacity to better *explain* a core concept in computer science.

(2) These case studies would in turn inform our attempts to adapt the tutored-video tool and accompanying instructional practices for use in disciplines beyond engineering and computer science. For example, would tutored video work as well for an English course in which a tutor convenes a session around a lecture of a professor discussing literary style? Would students perform as well on learning assessments that are likely to be some form of essay writing rather than a test of problem solving? The question of whether we would pursue this extension in a discipline quite different from computer science or engineering (e.g. English) or whether we would pursue it in a discipline more similar to these fields would depend on our findings from Phase 1. Our findings there will guide our judgment about the potential scope of tutored-video instruction. Our basic perspective is that the tools we design (or in this case re-design) may be considered an *embodied hypothesis* about how learning can be uniquely supported using educational technologies. In other words, by designing technology to support particular features of teaching and learning, we are hypothesizing that it is those features that are critical to its success. In this way, by learning from a project in one type of setting and strategically designing for a different but related setting, we will be testing our main proposition that these tools are generalizable.

(3) In this phase, following a significant amount of design on a working prototype of our tool, we would partner with the particular users (e.g. professors of English) to integrate the tool into their existing educational settings, much as UWired currently does on campus. Recent perspectives on the design of technology and curricula strongly suggest that this phase is critical to the adoption of new tools and practices (Bell, 1998; Suchman, 1994), since a complex technology cannot be simply dropped into a specific setting and expected to become functional. *In our project, we are seeking to strike a balance between designing generalizable tools and satisfying different learning objectives in a range of settings.* It is also important that this integration takes place before we form final conclusions about a tool's efficacy, because early usage of new tools can be unrepresentative of ultimate adoption (Bell, 1998).

(4) We close our research cycle by again studying the learning environment (parallel to phase 1) which now includes new tools and affiliated pedagogical practices. Detailed studies of *the process of learning in real educational settings combined with selective in-depth laboratory studies* are relatively new to the science of learning. Members of the PETTT team bring distinctive expertise to this line of research (Atman, 1999, 1996a, 1996b; Bell, 1998, in press; Hall and Stevens, 1995, 1997; Linde, Roschelle, and Stevens, 1994; Stevens, 1998; in press). In the PETTT project, we address specific questions: Is learning happening and if so how? What features of our general tool are being used to support this learning? For example, is tutored video used to support learning in English in comparable ways to

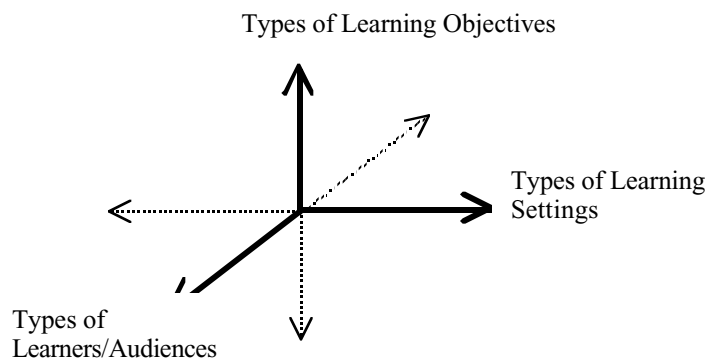
how it is used in Computer Science? In addition to the contributions that these studies will make to an understanding of learning in context, we will also be generating practical design knowledge to serve subsequent development, integration and dissemination activities (see “The Dissemination of Innovations” below). It should also be noted that our initial study in Phase 1 will serve as a baseline from which to assess the efficacy of the new tool and affiliated practices in this phase.

The extended example of tutored video instruction illustrates how our design plans are systematically related to the science of learning and shows how one relatively mature technological and pedagogical "package" (Fujimura, 1987; Salomon, 1996) will serve our overall goals. In the next section, we discuss how our two other exemplar projects, at different stages in their lifecycles, will be related to each other and to our long-term goals in PETTT project.

The lifecycle of educational technology projects. As described above, the arthritis source is an educational success being widely used by diverse audiences with interests in arthritis. It is therefore an exemplary instance of how technological representations of scientific knowledge can provide usable information to the public. As is the case of tutored video instruction, it is relatively mature and widely disseminated; however, we know very little about how the diverse audiences (doctors, patients, students, etc.) learn from this resource. At this time, no particular pedagogical activities support the learning objectives of particular audiences (e.g. recently diagnosed patients) as is the case with tutored video instruction. Given these conditions, we propose to enact the first two phases of the PETTT research cycle (described above) with the arthritis source. The near-term outcome of this cycle would be a set of tools and approaches that we hypothesize to be generalizable for faculty who wish to provide representations of their discipline's knowledge to diverse audiences through various interactive media formats.

To test this hypothesized generalizability, we will then move to Phase 3 of the cycle by using these general tools to build a comparable information resource *for our third exemplar project*: the Interactive Encyclopedia of Pacific Northwest Forests. This is a project early in its lifecycle; the College of Forestry is fully committed to its development and it will serve a clear need but the encyclopedia has not yet been built. The arthritis source and the encyclopaedia share the goal of providing an interactive resource for learning by diverse audiences through interactive media while differing in their specific audiences and scientific content. Therefore, connecting these two projects provides us with an immediate opportunity to test the overall 4-Phase PETTT research and development cycle.

Criteria for selecting new projects. The goal of fostering a science of learning provides principled criteria for selecting new projects beyond the three demonstration projects that begin our PETTT initiative. Because the objectives, types of learners, activities, and appropriate tools differ across learning environments (e.g. K-12 schools, communities, university teaching), we need to recognize and study this diversity. We will therefore choose projects that systematically expand our efforts into increasing diverse and challenging educational settings served by the University. For instance, the three demonstration projects will largely serve post-secondary audiences. While our focus will always be on serving the students of the University of Washington, an appropriate next generation of projects to support might be ones, initiated by university faculty, that use technology to pursue connections to K-12 education, a cornerstone of the University's mission. Even more generally, our goal is to systematically explore the dimensions of the following research "space" (to borrow a metaphor from mathematics) in our design and dissemination of integrated technologies and pedagogical activities.



Within this space, our selection criteria for choosing subsequent projects will be three-fold: (1) new projects must build upon existing strengths as we develop new tools coupled with pedagogical approaches, (2) projects should explore a part of space where there is strong faculty interest and expected impact is significant, and (3) projects should explore some new dimension of this research space as an ongoing test of whether our tools are generalizable in fostering learning.

Project Dissemination and Diffusion of Innovations

The successful diffusion of the tools and approaches to be developed by the PETTT initiative are the key to ensuring that this project will have a widespread impact on teaching and learning at the UW. In recent years, UWired has excelled at identifying the needs and concerns of faculty and other campus educators as they relate to using technology in their teaching. The partnerships forged in the PETTT initiative will greatly enhance the ability of the UW to develop and disseminate innovations in teaching and learning facilitated by the rise of new information technologies. A primary responsibility of UWired in this project will be to serve as the dissemination arm of PETTT. To ensure that the project succeeds in leveraging pilot activities into broader impacts we will pursue three primary strategies:

- (1) Coordinating the dissemination of tools, techniques and approaches through the recently launched Catalyst project,
- (2) Helping the PETTT team to identify "ripe" opportunities for the diffusion of innovations to colleges, schools, and departments through ongoing conversations with opinion leaders, and
- (3) Providing training and consulting support to units that show and interest in, and commitment to, the integration of technology into their programs and curriculum.

Our approach to the dissemination challenge is guided by the considerable research literature analyzing the diffusion of innovation.¹

Innovations--new ideas, practices or tools--are typically not adopted simply because they are technically superior to the status quo. They have to be effectively communicated within a social system, in this case the University of Washington, and their acceptance is a function of many factors. In keeping with the research on the diffusion of innovations, we will work to ensure that our approaches and tools:

- (1) convey a *relative advantage* over existing ways of doing things,
- (2) are *compatible* with the expectations, experience and needs of faculty,
- (3) *reduce the complexity* associated with working with new technologies,
- (4) are *trialable* in that they can be experimented with on a limited basis, and
- (5) are widely *observable* to the campus community.

Central to this will be the utilization of UWired's Catalyst Web site and related activities (see <http://www.washington.edu/uwired/catalyst>). The Catalyst Web site was created in an attempt to provide the campus with a central clearinghouse of information about teaching with new technologies and to provide a focal point for the development of the community of campus educators. Catalyst provides a "brand name" and a shell to centrally coordinate the dissemination of approaches, tools, and information about teaching with new technologies.

As the PETTT team develops new tools and approaches, UWired will translate these innovations into technical "how-to" documents, pedagogically oriented guides, workshop curricula, and project profiles. This material will be made available on the Catalyst Web site and will support department-level outreach activities aimed at disseminating the products of this project. This strategy is in line with diffusion research, which suggest the importance of using both broadcast (e.g., the Web site), and interpersonal communication channels to create acceptance for and adoption of new ideas.

Potential for Leverage through Commercialization

The Program for Educational Transformation Through Technology will develop products of commercial value. We are working with the UW Office of Technology Transfer (OTT) to ensure that both the University and the developers benefit from the commercialization of curricular products. These products will range from multi-media courseware to assessment tools. They will also include authoring packages that can be used by others. We are working with OTT from the inception of the ETTT program to identify in the early stages potential intellectual property (IP) problems and to ensure that our products can be disseminated through commercial channels to ensure maximum impact.

¹ The best summary of this literature is Everett M. Rogers (1995) *The diffusion of innovations*, fourth ed. New York: The Free Press.

Meta analysis

As described in preceding sections, research into the effectiveness of educational applications of technology is an integral part of the PETTT project. Within the context of the four phase "lifecycle" of pedagogical tools, the design and dissemination of instructional approaches will be systematically explored relative to types of learning objectives, learning settings and learners/audiences. Beyond these investigations, a meta-analysis of program activities and outcomes will enable PETTT leadership to make effective use of program resources. The two specific goals of the meta-analysis are to:

- Æ provide information to project (e.g., Arthritis Source) developers to aid development and determine effectiveness of individual projects, and
- Æ provide information to program (PETTT) leadership to guide direction and conduct of overall program.

Project evaluation. Projects to be developed within PETTT will be intentionally diverse and the approaches to assessment correspondingly varied. Project goals and indicators will be identified in collaboration with project developers, the research group, and PETTT leadership. Data collection and analysis will be coordinated with the needs and interests of the research group to maximize the usefulness of the information gathered. The types of indicators to be used may include web-use statistics, usability studies, assessment of learning outcomes, measures of user satisfaction, or reviews by content experts.

Program evaluation. Evaluation of the conduct and effectiveness of the PETTT program will center on the two overarching goals of the Program for Educational Transformation Through Technology:

- Æ (1) in conjunction with UW faculty and researchers, to develop instructional tools that
 - Æ a) utilize rapidly-evolving, next-generation information technologies,
 - Æ b) demonstrate effective and generalizable educational strategies, and
 - Æ c) can be accessed by learners with differing levels of experience, and
- Æ (2) to widely disseminate effective tools and strategies to
 - Æ a) UW faculty,
 - Æ b) other constituencies throughout Washington State, and
 - Æ c) national and international audiences.

Indicators of program success will be developed in collaboration with PETTT leadership, and may include such indices as the number and success of projects developed within the PETTT framework, faculty perceptions and use of resulting pedagogical tools, changes in instructional approaches at the UW and elsewhere, and adoption of PETTT tools at other institutions. At both the program and project levels, evaluation will focus on educational effectiveness as well as level of service delivery (number of users, scope of project, etc.), and particular attention will be paid to possible unexpected outcomes. This ongoing 'peer review' of the Program will assure that it is held accountable to its stated purposes.

Leadership and Organization

Leadership of the Program for Educational Transformation Through Technology will rest with an Executive Committee consisting of **Frederick A. Matsen III** (Orthopaedics) Chair, **Louis Fox** (Office of Educational Partnerships), **Ed Lazowska** (Computer Science & Engineering), **David B. Thorud** (Forest Resources), and **Denice Denton** (Engineering).

Lazowska, Matsen, and Thorud will take responsibility for the three initial demonstration projects. Fox will take responsibility for on-campus and off-campus partnerships, and will directly supervise a **Program Coordinator** (to be recruited) who will report to the Executive Committee and who will provide overall coordination of the Program.

Research regarding the science of learning and educational effectiveness will be the responsibility of **Phil Bell** and **Reed Stevens** (College of Education) and **Cindy Atman** (Center for Engineering Learning and Teaching). This group will lead in the design and evaluation of new educational strategies made possible by technology. They will guide the selection of successive demonstration projects to explore the universe of educational activity. James F. Gibbons (Stanford University) will aid assessment efforts.

Christine Murakami and Mark Donovan (Director and Associate Director of UWired) along with **Louis Fox** will be responsible for the dissemination of the educational strategies and technologies to faculty both at the University of Washington and in the context of our educational partnerships. Program staff (one Software Engineer and two Educational Technology Designer/Analysts) will be housed in the UWired Center for Teaching, Learning, and Technology. Dissemination of Program materials, techniques, and findings will occur through UWired, using its Catalyst program and other resources. UWired has already begun to reconfigure their current space and staffing in anticipation of the activities proposed here.

The meta analysis of the Program will be conducted by **Nana Lowell** along with Denton and Donovan, making certain that PÉTTT remains on its intended course.

Exploring possibilities for copyright, commercialization and leverage will be the task of Denton and Fox. Anoop Gupta (Microsoft Research) will provide liaison with Microsoft for software and educational technology research. Dennis Schaffer (NSCC) will provide liaison with Washington's community and technical colleges.

Budget Narrative:

Program Director: This position will coordinate all aspects of the project, under the direction of the Executive Committee.

Design Team: Software Engineer; Educational Technology Designer-Analyst; Undergraduate Student Designer-Analysts (3).

We are committed to using “off the shelf” software solutions. However, sophisticated technical skills can be required to make these solutions easily usable by the mainstream, and to integrate multiple solutions into a coherent whole (sometimes filling the gaps between them); the Software Engineer will provide these sophisticated technology skills.

Matching the appropriate educational technology to a particular educational setting – determining the right way to achieve a particular educational goal, and carrying it out – is the role of the Educational Technology Design-Analysts and the undergraduates who will assist him/her in the support of specific projects.

Science of Education Team: Professors Atman, Stevens, and Bell; Research Faculty; Post-doctoral Scholar; Graduate Student Researchers (3); Undergraduate Student Researchers (3).

We assume that there will be three researchable projects ongoing at any given time. Each project will have multiple empirical studies being coordinated within it. Each project will have between one and three field and/or lab studies ongoing – for up to a total of nine possible studies at a given time. These projects will be done under the direction of Professors Atman, Stevens, and Bell, with the day-to-day details of the various studies overseen by the Research Professor. In addition to the “science of education” studies, this team will also focus on the project evaluation, using standard statistical evaluations as well as meta-analysis.

The graduate and undergraduate students will serve, similar to the Design Team students, as support for specific projects, under the direction of the senior members of the team.

- Meta analysis** An important component of PETTT is ongoing analysis of its own programmatic effectiveness with regular feedback to the leadership on the degree to which it is meeting its goals and to provide critical analysis on ways in which it can be more effective. We envision a 50% position dedicated to leading this aspect of the Program.
- Hardware and Software:** Though we anticipate that external partners will donate much of the required hardware and software, additional specialized equipment will be required for this project. (Some examples include digital video cameras, high-end computers with video capture boards, digital video raid for storage purposes, etc.)
- Operations:** Transcribers, office supplies, photocopying, telephone, etc. (Space will be provided in the UWired Program or in the units where projects are underway.)
- Building Unit Capacity** The positions above are “leverage” – roughly put, they “mine” the exemplar projects for highly effective technical and educational approaches that, with some refinement, can be efficiently transferred to the campus at large. Building “absorptive capacity” in the units – the ability to adopt new approaches – is a critical complement to this. The UWired experience suggests that a jumpstart often is all that is necessary – short-term provision of “Technology TA’s,” faculty release time, support for staff to transition to new roles, etc.