NSF CPATH 2007 Award Portfolio

CISE Distinguished Education Fellows Awards

0720999 - PI: Peter Denning (Naval Postgraduate School)
Resparking Innovation in Computing Education

Supporting US competitiveness with a greater supply of talented, innovative computing graduates.
Through a series of national workshops this project will (a) Articulate the great principles of computing; (b) Uncover and inspire computing curriculum innovations and ongoing experimentation; (c) Develop a new "operating model" for teaching and applying computer science; and (d) Expand the set of departments using project based learning.

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0722274 - PI: Owen Astrachan (Duke University)
Interdisciplinary Problem and Case-based Computer Science

Business and life-science education inspire new pedagogy.
This project uses interdisciplinary case-based and problem-based learning (PBL) modules for introducing computer science to majors in other fields as well as those students studying computer science. Well-designed and implemented PBL modules be effective with a group of students beyond those considering computer. Using an approach with a track record in medicine and business, but also with proven success in postsecondary biology and engineering, courses will encourage new pedagogical methods and attract new audiences to computing.

Evaluation, Adoption, and Extension Awards

0722212 - PI: Vijay Pai (Purdue University)
Extending a Bottom-Up Education Model to Support Concurrency from the First Year

Students learn about multicore concepts.
The processor industry's multicore-revolution has already changed the future of hardware design and will have a dramatic impact in software development and algorithms. This project includes parallelism as an essential substrate of education in the computer field, from the very first year of college. Purdue's Computer Engineering and Engineering Education divisions will implement this strategy and disseminate findings and models for other educators to integrate parallelism more effectively.

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0722313 - PI: James Westall (Clemson University)
TEXNH - Evaluation, Adoption and Extension

Visual media and problem-based instruction to support learning.
Clemson will extend a zero-based redesign of the B.A. degree in Computer Science using an approach called TEXNH. The curriculum is based upon problem-based instruction in the domain of computer generated visual media. Problem-based instruction is used as a vehicle, but course design differs from others in the depth, scope, and open-ended nature of the problems employed. Problem domains are non-traditional and selected specifically to attract and motivate students.

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Evaluation, Adoption, and Extension continued

Collaborative: 0722163 0722157, 0722177, 0722238, 0722270
PIs: Charles Isbell, Ju Wang, Elizabeth Sklar, Ashraf Saad, Pamila Dembla   (Georgia Tech, Southern Polytech, CUNY Brooklyn Col., Armstrong Atlantic, Kennesaw State)
Extending Contextualized Computing in Multiple Institutions Using Threads

A new structuring principle for computing curricula.
This project extends the Threads model at a diverse set of institutions. Threads centers around the notion that computing has evolved into an inter- and intra-disciplinary field of intertwined concepts that pervade society calling for a number of specialized degrees and contextualized computing courses. The Threads model includes a process for creating curricular change, an infrastructure for advising, and software to support administrators, advisors, educators and students. This alliance will validate and extend the Threads model to: (1) take advantage of lessons learned; (2) use those lessons to inspire and guide similar processes of reform on four other campuses; (3) establish a comprehensive system of evaluation, assessment and reporting; and (4) lay the groundwork for bringing the expanded program to campuses nationwide.

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Collaborative 0722112 and 0722141 - PIs: Sandeep Purao and Vijay Valshnavi (Penn State University and Georgia State)
Learning to Build Systems of Systems

Preparing students to build large and complex systems.
This project addresses the need for professionals who can build and support large and complex systems of systems. The strategy for addressing this has five elements: *Organizational:* establishing a separate College of Information Sciences and Technology; *Curricular*: establishing a sequence of courses specifically aimed at Systems Integration; A*ctive-learning*: implementing of a repository of resources and a learning environment; *Problem-based learning:* delivering courses through team-based problems; and *Experiential learning:* projects, sponsored by partners from industry and government, that student teams build integrated systems solutions. In addition to articulating this strategy, this project involves its adoption at a collaborating institution.

Institutional Transformation Awards

0722327 - PI: Leonard Pitt (Univ. of Illinois, Urbana-Champaign)
iCUBED: Informatics and Computation throughout Undergraduate Baccalaureate Education

Illuminates new pathways to careers in informatics.
This project is based on the notion that levels of engagement in computation can be viewed on a continuum, from novice user to "super-techie" programmer and people from *any* discipline should be able, when in this continuum, to find courses and programs that move them towards "super-techie" *in the context of their interests.* The iCUBED model is about multiplying the power of "i": This includes **I**nside Reform from within CS, interdisciplinary reform, and institutional reform.

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Institutional Transformation Awards continued

Collaborative 0722211and 0722203 - PIs: Chun Wai Liew and Valerie Barr (Lafayette College and Union College)
Campus Wide Computation Initiative - A New Model for Computing Education

A blueprint for change in computing education.
This project develops a model for a campus wide computation initiative to transform computing education. Students and faculty who are outside the typical computing community are engaged in computation. Transformation is achieved through the involvement of (1) faculty leaders inside the computing community in teaching and research collaborations with faculty and students from outside the computing community, and (2) faculty and industrial partners who develop programs that highlight the increasingly important role of computation in their respective industries.

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0722287 - PI: David Lee (Ohio State)
NEWPATH: Nurturing, through Entrepreneurship, IT World Leaders

Preparing students to be entrepreneurial leaders.
NEWPATH establishes a special undergraduate education program with an emphasis on integrative computing for nurturing future IT industry world leaders and for bringing transformational impact to undergraduate computing programs. Highly motivated and talented students are recruited directly into the program from high school. Each NEWPATH student also completes an Interdisciplinary Minor in Entrepreneurship. Each student will have an industry-mentor, will participate in an entrepreneurship training program, and participate in an innovative practice component of the curriculum. This "E-Practicum" will be modeled on a successful course sequence for MBA students and adapted to the needs of undergraduate students.

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0722328 - PI: Kenneth Goldman (Washington University)
Active Learning for Transformation of the Undergraduate Experience

A model for institutional transformation to active learning.
This project builds important communication, teamwork, and leadership skills and provides an opportunity to teach the creative design process through discussion and critique of student work. This project transforms student and faculty interaction to produce educational benefits by devoting class time to active learning while shifting traditional lecture content to outside of class. Supporting materials are organized in a way that empowers students to control their learning experience. Foundational material is taught through carefully planned problem-based learning sessions, and design and implementation are taught in collaborative inquiry-based studios. It makes existing curriculum more accessible in order to provide efficient paths for students in diverse fields to gain the necessary background for meaningful participation in multidisciplinary projects.

Community Building Awards

0722218 - PI: Michael Gennert (Worcester Polytechnic Institute)
Building Community via Robotics Innovations Competition and Conference

Multidisciplinary robotics competition.
This project involves a multidisciplinary, entrepreneurial robotics innovations competition including community building conference sand workshops where students design and build robots to perform useful and novel tasks with emphasis on open-ended, real-world problems with intellectual, commercial and/or humane aspects in the solutions.

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0722192 - PI: George Rouskas (North Carolina State University)
Computing Across Curricula

Preparing students for computational thinking in the workplace.
This project involves multidisciplinary, academe-industry community development to address creative strategies for transforming undergraduate computing education with a "computational thinking thread" in the freshman to senior years, and students enabled to perform computing competency in high-level computing tasks within the context of a discipline.

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Collaborative 0722341 and 0722342 - PIs: Andrzej Proskurowski and Cynthia Brown (Univ. of Oregon and Portland State University)
Internationalization of Computer Science Education: The Pacific Rim Community Model

Preparing students to work and to lead in a global community.
A Pacific Rim community of computer science departments, high tech industry and international programs explore a new model of computing education, infused with international perspectives, focused on the knowledge, skills and competencies necessary for professional success and leadership in a flat world. The project will produce outcomes that are globally relevant and long-lasting. Workshops will address four key topics: assessing the needs, benefits and barriers to internationalization cultural impacts on computer science courses and pedagogy cultural awareness through international experiences and community sustainability.

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0722172 - PI: John Shirley (Los Rios Community College District - Folsom Lake College)
Sacramento CPATH Community Building Project

Meeting the need for new kinds computing professionals.
This project involves a multi-institution, multi-sector, and multi-disciplinary collaboration and strategies for revitalizing undergraduate computing education through linkages between computing educators, professionals, and employers who will transform undergraduate computing education in the Sacramento region. It involves community engagement and leadership development: creating interdisciplinary components; establishing a CPATH advisory committee; offering a regional symposium on undergraduate computing education; and developing a pilot program proposal or transformation plan.

Community Building Awards continued

0722301 - PI: Karen D'Arcy (Governors State University)
Content and Context: Building Collaborative Partnerships in Higher Education and Industry

Demand driven requirements for success as a computing professional.
This Governors State University, Argonne National Laboratory and Joliet Junior College partnership brings the Chicago metropolitan regional community together with computing professionals from across the regional industrial sectors, the research community, and the not-for-profit community to engage in a learning process which will reveal the relevant knowledge, skills, and dispositions required for computing professionals in the Chicago metropolitan region as well as make predictions of future needs and trends.

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0722277 - PI: Nicholas Webb (SUNY Albany)
Social Robotics

Using Social Robots to motivate students.
This project builds a community of stakeholders in social robotics in upstate New York including workshops at a local public museum and collaboration of stakeholders consisting of academics, students, and representatives from industry and members of the public, to outline a program in social robotics.

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0722288 - PI: Jeffrey Forbes (Duke University)
Building Community via the Science of Networks

Changing perceptions about computing using social networks.
In this project, computer science is introduced without emphasizing the process of programming. The project leverages the expertise and role-models provided by educators from other fields by studying topics that arise from the science of networks and modeling to introduce computer science as an alternative to the traditional programming approach. Faculty learning communities will meet to develop, implement, and adapt modules of networks for use in a variety of courses.

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0722178 - PI: Jeffrey Johnson (Bellevue Community College)
Planning Grant: Building a Community to Revitalize Community College Undergraduate Computing Pathways

A testing ground for new models of undergraduate computing.
The Center for Information Technology Education at Bellevue Community College and NWCET will work with Advanced Technology Education centers and projects to develop nationwide pilot sites for new computing education models involving inter-disciplinary/multidisciplinary course formats, problem-based learning, service learning, and learning communities.

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0722237 - PI: Deborah Boisvert (University of Mass – Boston)
A Community Addressing Seamless Information Technology Education for Students (CSITES)

Leaders in IT education address critical need for skilled workers.
Three regional consortia will partner to participate in CPATH CSITES – Boston (University of Massachusetts Boston, Bunker Hill and Roxbury Community Colleges); Northern Virginia (George Mason University and Northern Virginia Community College) and Northwestern Indiana (Purdue University Calumet and Ivy Tech Community College of Indiana). These partners are implementing seamless model 2- and 4- year curricula within their respective institutions and are committed to innovation that advances the transformation of undergraduate computing education.

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0722339 - PI: Michael Clancy (University of California – Berkeley)
A Community for Lab-centric Computer Science Instruction

Lab-centric courses benefit underrepresented students.
This project assembles a diverse team of leaders in communities related to lab-centric instruction including experts in CS curriculum, pedagogy, teacher education, digital repositories, and educational technology. This team will evaluate the state of lab usage and barriers to adoption of lab-centric formats; create an online space to support the growth and functioning of the lab-centric community; recruit instructors to develop and refine a small number of lab-centric segments for inclusion in upper-division CS courses, and evaluate the effectiveness of the supporting tools and materials for this development and wider community interaction; provide outreach for the lab-centric community and the online center and disseminate the project results through a variety of forums.

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Collaborative 0722137, 0722134, and 0722199
PI: Ralph Morelli, Danny Krizanc, Gary Parker (Trinity College Connecticut, Wesleyan University, Connecticut College)
Can Humanitarian Open-Source Software Development Help Revitalize Undergraduate Computing Education?

Open-source, disaster recovery IT system inspires innovation.
The project was inspired by Sahana, an award-winning, open-source, disaster recovery IT system that was created following the 2004 Asian Tsunami. The project co-sponsors have collaborated successfully in building Sahana's volunteer management module and will now explore whether the open-source development model can be used to help revitalize undergraduate computing education

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Collaborative 0721927, 0722139, 0722323 - PIs: Cristopher Hundhasen, N. Narayan, and Martha Crosby (Washington State Univ., Auburn University, University of Hawaii)
Exploring Studio-Based Instructional Models for Computing Education

Studio-based learning borrowed from architectural education.
This project involves an innovative pedagogical approach to undergraduate computing instruction through a combination of educational reform and research at three universities and several regional institutions and vigorous regional and national community building activities. This project refines and evaluates a studio-based pedagogy that actively engages undergraduate students in collaborative, design-oriented learning and builds a regional and national community of computing educators interested in applying this approach and assessing its impact.

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0722161 - PI: Jesse Heines (University of Massachusetts Lowell)
Performamatics: Connecting Computer Science to the Performing, Fine, and Design Arts

Inspiring students through computing and the Arts.
This project builds on a collaboration between the CS and Art departments called *Artbotics*. Performamatics will consist of a set of courses that bring together CS majors and those from the arts and humanities. These will begin in the freshman year with Artbotics, a project based course in which technical and non-technical students are introduced to computer science, robotics, and the arts. Upper-level courses will focus on the performing and design arts, where majors from various departments will work together in multi-disciplinary teams to extend and deepen knowledge of their own field while directly seeing its applicability across disciplines.

Community Building Awards continued

0722209 - PI: Michael Moshier (Chapman University)
Planning: Supporting Non-CISE Majors in a Computing Community

Open-source and the Arts inspire curricular change.
This project develops a Masters Seminar Series and a Center for Open Source Solutions. The Masters Seminar Series, modeled on conservatory Masters Classes in the arts, brings professionals to campus from a wide variety of fields whose contributions in those fields have advanced the use of computation and technology. Masters Seminars are planned in a variety of disciplines including computational biology and chemistry as well as in the arts and humanities. The Center provides both physical space for collaboration and a virtual clearinghouse of resources for development of open source solutions in various disciplines.

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0722221 - PI: Thomas Wolff (Michigan State)
Computing and Undergraduate Engineering: A Collaborative Process to Align Computing Education with Engineering Workforce Needs

Aligning computing education with engineering workforce needs.
Michigan State University, Lansing Community College and the Corporation for a Skilled Workforce partner to design and implement a process to create a collaboratively-defined computing education within the engineering and technology fields in alignment with the computational problem-solving abilities needed to transform mid-Michigan's economy and workforce. A wide variety of stakeholders – business, community leaders and post secondary educators – will collaborate to identify workforce computational skills, define how these skills can be integrated across a curriculum, and develop a revised curricula that integrates computational problem-solving across engineering departmental courses.

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Collaborative 0722259, 0722276, 0722289, 0722263
PIs: Edward Fox, Wingyan Chung, Robert Beck, Edward Carr
(VPI, Villanova, North Carolina A&T, UTEP)
Living In the Knowledge Society (LIKES)

Preparing students for a Knowledge Society.
This CPATH Community Building project will help lead the Knowledge Society of the 21st Century. Central to that vision is the increase in useful application of computing for individuals, groups, organizations, and societies in the USA and worldwide. This project will identify the knowledge and information needs of a range of disciplines, then map these needs to key computing concepts, revitalizing research and education. Students in computing disciplines will learn more, as they address real problems integrated into their curricula

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0722261 - PI: Jennifer Berg (Wake Forest)
Revitalizing Computer Science Education through the Science of Digital Media

Coupling computer science with art.
This project focuses on *the science of digital media* as a core, and builds natural interdisciplinary relationships, tight links between science and application, and seeks continuous feedback from educators and employers. Its has many goals involved in establishing a network of educators and business/industry representatives to develop the science of digital media as a conceptual focus from which to model a curriculum that can reinvigorate computing education and developing and implementing models based on this focus.

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0722210 - PI: Susan Hambrusch (Purdue)
Computing Education in Science Context

Computational thinking integrated into science education.
This project develops a framework for a two-course sequence that introduces science majors to computational thinking, to the parallels between computational concepts and scientific models, and to the role of computation in exploring and understanding of physical phenomena. Annual workshops will be held at Purdue to facilitate interaction with other institutions striving for the same goal and to build a broader community developing the principles of a computing education for science undergraduates.

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0722362 - PI: Carlos Jensen (Oregon State University)
Building a Platform for Learning - A Learner Centered Approach to Computer Science Education

This project builds a community around integrating a platform for learning model into the computing education of undergraduate students. The model is based on a successful similar paradigm used within electrical engineering education at the lead university. Curriculum revision is based on four major themes: multi-core programming, graphics and animation, software engineering fundamentals, and open-source contributions. A key element of the project is the continued development and evaluation of an open-source community of code repository to support software development and the student community of learners as well as the broader academic community at other institutions. The project includes community outreach to university, community college, and industry partners within Oregon as well as on a national scale.

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