



DIGITALLY ENHANCING AMERICA'S COMMUNITY COLLEGES



STRATEGIC OPPORTUNITIES FOR COMPUTING EDUCATION

Report of Findings

from the 2010

Strategic Summit on the Computing Education Challenges at Community Colleges

sponsored by the National Science Foundation
and the Association for Computing Machinery



Authors

Elizabeth K. Hawthorne, Ph.D.

Robert D. Campbell

Karl J. Klee, Ph.D.

Anita M. Wright



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Quotations identified herein have been edited for length and clarity from blog postings and transcripts of the discourse at the *Summit*, which was held in Philadelphia, PA, April 28 – 30, 2010.

ACM (<http://www.acm.org>) is the world's largest educational and scientific computing society, delivering resources that advance computing as a science and a profession. The Committee for Computing Education in Community Colleges (formerly the Two-Year College Education Committee) is the standing committee of the ACM Education Board concerned with computing education at associate-degree granting colleges and similar post-secondary institutions throughout the world. The Committee serves its constituents through a variety of curricular and advocacy activities, including maintaining "CAP Space" (<http://www.capspace.org>), an interactive repository of associate-degree curricular, assessment and pedagogy resources for computing education. The Committee advises the Education Board as directed on all issues concerning curriculum, pedagogy and assessment, and engages in advocacy and policy for this sector of higher education.

The National Science Foundation (<http://www.nsf.gov>) is an independent agency of the U.S. Government whose mission is to promote the progress of science; to advance the national health, prosperity, and welfare; and to secure the national defense. The foundation competitively awards grants for research and education in the science, technology, engineering, and mathematics fields.

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▶▶▶ **SUMMIT STEERING COMMITTEE MEMBERS/ACM CCECC MEMBERS**

- ▶ Elizabeth K. Hawthorne, Ph.D.; Chair
- ▶ Robert D. Campbell
- ▶ Karl J. Klee, Ph.D.
- ▶ Anita M. Wright

▶▶▶ EXECUTIVE SUMMARY

This report details the findings of the *Strategic Summit on the Computing Education Challenges at Community Colleges*, funded by the National Science Foundation and conducted by the ACM Committee for Computing Education in Community Colleges. The report identifies twenty specific challenges and associated opportunities compiled by a diverse panel of experts; these findings are elucidated by actual quotes captured during the deliberations. The intent of the *Summit*, and therefore of this report, is to spur grant proposals, initiatives and partnership activities led by community college computing faculty and academic administrators.

A reading of the report reveals that:

- ▶ Active collaboration is required among the various sectors of education (high school, two-year colleges, four-year colleges and universities), together with business and industry, to address the challenges identified and achieve the opportunities noted.
- ▶ Well-defined computing nomenclature, curricula, assessment techniques and educational pathways are required to position the computing disciplines as first-choice career options for two-year college students and to facilitate student achievement.
- ▶ The unique characteristics of computing education in community colleges require approaches and solutions specifically tailored to this field of study.

America's community colleges have never had a higher profile – or shouldered a higher expectation – than today at the local, state and federal levels. This report calls for actions across the breadth of associate-level computing programs which reflect the multi-faceted role of two-year colleges: to serve students entering the local workforce, to serve students transferring into baccalaureate programs and to serve students pursuing continuing skills development.

The extraordinary rate of technological change, the current trends in sustainable computing, mobility, cloud computing, cybersecurity and information privacy, and the impact of technology on the fundamental notions of higher education and career employment portend the transition underway from the Information Age of the last century to the creative age of the current century. Correspondingly, the President of the United States, in noting that “community colleges are one of the keys to the future of our country”, has called for the production of college graduates who “possess 21st century skills like problem-solving and critical thinking, entrepreneurship and creativity” together with “new ways for businesses and community colleges to work together.”

This then is the context in which the state of computing education in America's community colleges was examined. We live in an exceptional age, one which provides numerous challenges to past practices and mindsets and offers untold opportunities to shape the future. This report, “Digitally Enhancing America's Community Colleges ▶▶▶ Strategic Opportunities for Computing Education” undergirds this call for action.

▶▶▶ BACKGROUND

The ACM Committee for Computing Education in Community Colleges (CCECC) conducted the *Strategic Summit on the Computing Education Challenges at Community Colleges* on April 28-30, 2010 in Philadelphia, PA. Funded by the National Science Foundation's "Advanced Technological Education" program, and with the express intent of providing a foundation and impetus for future NSF ATE grant proposals, the goal of the *Summit* was to identify the major challenges facing computing education in America's community colleges.

To ensure a broad view, a diverse group of thirty-three professionals from two-year colleges, four-year colleges, high schools, industry and government were invited to participate in this *Summit*. These experts engaged in spirited discourse framed by three themes: *Perceptions, Preparation and Environments*. To seed the breakout discussions, designated panelists delivered succinct presentations from three perspectives, *Employer, Faculty and Student*, after which the participants assembled into small groups for extended periods of focused interaction and exchange of ideas. The participants subsequently reconvened in the whole to share the salient challenges identified by each subgroup.

All presentations and breakout discussions were digitally recorded and the many hours of captured conversation along with pre-*Summit* interactive blog postings served as the foundation for producing this report. A draft of this report was reviewed by the participants and the advisory committee for accuracy, clarity, and content prior to this publication.

▶▶▶ MATERIALS AVAILABLE ONLINE

This Report is available from:

- ▶ the ACM CCECC website: <http://www.acmccecc.org>; or
- ▶ the Ensemble national digital library: <http://www.computingportal.org>

Supplemental resources are available at the ACM CCECC "CAP Space" website:

- ▶ Computing Education Resources:
<http://www.capspace.org/CompEdResources>
- ▶ References: <http://www.capspace.org/References>
- ▶ Strategic Planning Materials: <http://www.capspace.org/StrtgcPlnngMatls>
 - ▶ Potential Strategic Planning Initiatives & Funding Opportunities
 - ▶ Strategic Planning Template ... a poster-sized format of the 20 Findings intended to foster interactive discussion and follow-up activities; preview available via the above link, printed copy available upon request via the "Contact Us" form at <http://www.capspace.org/contactus>.

▶▶▶ FINDINGS: CHALLENGES & OPPORTUNITIES

- ▶ 1 Promoting Computing Education in Community Colleges
- ▶ 2 Embedding Computing Education in Our Changing Society
- ▶ 3 Demystifying Computing Disciplines and Professions
- ▶ 4 Actualizing Pathways in Computing Education
- ▶ 5 Assessing Incoming Computing Students
- ▶ 6 Facilitating Student Completion of Computing Programs
- ▶ 7 Cultivating Student Diversity in Computing
- ▶ 8 Engaging Computing Students of Tomorrow
- ▶ 9 Applying Learning Research to Computing Education
- ▶ 10 Pioneering Assessment Strategies for Computing Coursework
- ▶ 11 Innovating Instructional Materials for Computing Courses
- ▶ 12 Embracing Anytime, Anywhere Computing Education
- ▶ 13 Keeping Infrastructure Current for Computing Programs
- ▶ 14 Preparing Students for the Computing Careers of the Future
- ▶ 15 Addressing the Comprehensive Needs of Employers
- ▶ 16 Responding to Competing Demands on Computing Curricula
- ▶ 17 Contextualizing Computing Studies
- ▶ 18 Serving Professional Development Needs of Computing Faculty
- ▶ 19 Attracting and Sustaining Computing Faculty
- ▶ 20 Meeting the Unique Needs of Computing Departments

▼ PROMOTING COMPUTING EDUCATION ▲ ▼ IN COMMUNITY COLLEGES ▲

▼ Challenge

America's two-year college computing education programs are frequently undervalued. High-school graduates may not consider them as their first option for college. Baccalaureate institutions may not embrace them as sources of transfer students into upper-division computing programs. And employers may not perceive them as producers of qualified graduates. Misimpressions arise from negative stereotypes and the failure to recognize the value of associate degrees in computing.

Opportunity ▲

Computing faculty, program coordinators and administrators in two-year colleges should collaborate and communicate with colleagues in other educational institutions and in the business sector to raise awareness of the program outcomes and assessments of student learning that define associate-degree computing programs.

Colleges can do a better job of educating not only students but also parents about the benefits of a community college education.

*K. Yohannan
EMC Corporation, MA*

Community colleges are leading the way and changing the model of education!

*J. Walker
University of Arkansas at Pine Bluff, AR*

▼ EMBEDDING COMPUTING EDUCATION ▲ ▼ IN OUR CHANGING SOCIETY ▲

▼ Challenge

Computing educators are challenged by extraordinary, technology-driven societal changes to expand their roles beyond the traditional delivery of discipline-specific course content.

Students need to understand how a digital footprint could come back to haunt them.

J. Scheeren
Westmoreland County
Community College, PA

Opportunity ▲

Two-year college computing faculty should engage their students in important discussions on information assurance, privacy rights and intellectual property. They should promote thoughtful consideration of sustainability issues, prepare students for profound shifts in the labor market, and advance interdisciplinary computing. With their high school and baccalaureate colleagues, they should influence decisions on the nation's approach to computing education.

The federal government needs to protect critical IT infrastructure by supporting training initiatives that are wide-reaching and consistent across the country.

B. Oldfield
Department of Homeland Security,
National Cyber Security Division, DC



DEMYSTIFYING COMPUTING DISCIPLINES AND PROFESSIONS



▼ Challenge

The mélange of course and program titles and requirements throughout computing education confounds students, parents, faculty, advisors, guidance counselors, administrators, employers and practitioners.

Opportunity ▲

Stakeholders should collaborate to produce clear and consistent guidance regarding the breadth and depth of computing education and careers. Improved standardization should be pursued to enable students to progress along well-defined pathways leading from their initial interest in computing to attaining a college degree to launching a career in computing.

If students don't know what computing is, why would they pursue it?

C. Seals
Auburn University, AL

I was on a statewide committee to decide articulation models. We agreed on models for mathematics and science – including chemistry, biology and physics – in a matter of minutes. Eight hours later, we had not resolved the CS-1 articulation issue for computer science!

B. Grasser
Lakeland Community College, OH



ACTUALIZING PATHWAYS IN COMPUTING EDUCATION



▼ Challenge

Students are limited in their opportunities to avail themselves of computing curricula in a cost-effective and time-efficient manner due to inconsistencies and complexities that span student progression from high school to two-year college program completion to baccalaureate articulation and transfer.

▲ Opportunity ▲

Educational institutions should employ multi-faceted strategies that move students seamlessly through their computing education studies from the secondary level through the associate degree to the baccalaureate degree.

Community colleges provide a tiered pathway to career goals.

K. Yohannan
EMC Corporation, MA

Establishing relationships between community colleges and high schools could help educate parents.

S. Miranda
Morse High School, CA

The K-20 pathway doesn't exist! Coursework doesn't transfer because they didn't use this language or that process or this textbook.

D. Irwin
Ballston Spa School District, NY

ASSESSING INCOMING COMPUTING STUDENTS

▼ Challenge

Community colleges are challenged to effectively place incoming students into computing course sequences and programs, mainly because today's students have acquired computing skills through formal, informal and non-formal education.

Students who are interested in pursuing computer science or computer engineering often find themselves ill-prepared for that coursework.

R. Blair
Miami Dade Virtual College, FL

▲ Opportunity ▲

High schools and community colleges should create pathways, linkages and partnerships between their secondary and post-secondary computing courses and programs. Community colleges should develop meaningful assessment tools that measure the computing knowledge and abilities of all incoming students.

Students pass high school exit exams, but fail college entrance exams. Where's the disconnect?

A. Verno
Bergen Community College, NJ

Parents of my struggling students frequently say "He's on the computer all the time - I don't understand why he is having problems in this course." Why do parents think that because their son is doing whatever on the computer, this will automatically make him successful in my beginning programming class?

R. Hopkins
Naperville North High School, IL

▼ FACILITATING STUDENT COMPLETION ▲ ▼ OF COMPUTING PROGRAMS ▲

▼ Challenge

Two-year college students encounter varied obstacles to their timely completion of computing program requirements, including insufficient academic preparation, especially in mathematics; mismatches between their learning styles and the rigor of computer studies; misalignment between their academic paths and their career aspirations in computing fields; and limited opportunities to fulfill degree requirements.

Opportunity ▲

Two-year colleges should pursue innovative approaches to academic and student support services, creative strategies for providing guidance on computing careers and associated curricula, and varied avenues by which students can satisfy program requirements.

Mathematics preparedness is a major issue ... for example, students who want to do game programming need mathematical skills sufficient to handle the basic tasks of manipulating 3-D objects.

J. Strausser
Tidewater Community College, VA

Because students today have a variety of learning needs, faculty must understand how to access and utilize an array of support services.

M. Pelz
Rochester Institute of Technology
National Institute for the Deaf, NY

Online courses are increasing in popularity, but usually lack ancillary services. Students recognize that ancillary services help them succeed, and will choose an institution that provides online services such as orientation, counseling, and e-tutoring.

A. Bird
Clover park Technical College, WA



CULTIVATING STUDENT DIVERSITY IN COMPUTING



▼ Challenge

Gender- and culture-based stigmas associated with certain technical disciplines, as well as insufficient opportunities for students to visualize themselves in computing careers, hinder a rich diversity of students from enrolling in computing programs. From middle school until they enter college, the absence of positive role models in computing negatively impacts student attitudes and perceptions, especially among females.

Barbie says math is hard: a classic, dysfunctional doll tells 10-year-old girls, “This stuff is hard and I don’t want to do it.”

*B. Grasser
Lakeland Community College, OH*

▲ Opportunity

Educational institutions, professional organizations, and business and industry should partner to create nurturing experiences in technology-related fields for students, especially females and individuals from underrepresented groups. Computing professionals should serve as mentors to students to promote the attractive financial and socially-rewarding aspects of computing careers.

I have a hard time in high school getting girls interested in robotics or anything that’s considered “nerdy”.

*J. Trujillo
Santa Fe Indian School, NM*

Messages via the media suggest that girls are not as skilled or capable at computing.

*M. Semmer
Joliet Junior College, IL*

ENGAGING COMPUTING STUDENTS OF TOMORROW

▼ Challenge

Student engagement with computer technologies such as social networking, online media and virtual worlds, as well as students' enthusiasm for video games and consumer electronics, challenge the traditional approaches to classroom-based instruction in computer education.

▲ Opportunity ▲

Community college computing faculty should promote innovation in instructional design and delivery by prototyping, mastering and implementing pioneering technology-based teaching and learning strategies and techniques.

You get more from your students when you're using their communication methods rather than forcing them to use yours.

A. Verno
Bergen Community College, NJ

Students ask me why they should read a textbook when so much information is readily available via their mobile devices!

C. Seals
Auburn University, AL

Even YouTube has a portal with targeted educational content ... we are going to become irrelevant if we don't embrace online and open source education.

M. Qaissaanee
Brookdale Community College, NJ



APPLYING LEARNING RESEARCH TO COMPUTING EDUCATION



▼ Challenge

There is insufficient information available to two-year college computing faculty about how students today synthesize technical knowledge and acquire the inductive and deductive reasoning skills required of computing professionals.

Opportunity ▲

Cognitive learning research in computing should be used to positively inform and influence faculty approaches to course design and delivery for active learning computing education.

Faculty often do not have the flexibility or the freedom to try something different that may serve students a whole lot better.

*L. Cassel
Villanova University, PA*

Traditional ways of measuring the learning process no longer work ... those techniques are too passive.

*J. Sands
Moraine Valley Community College, IL*

▼ PIONEERING ASSESSMENT STRATEGIES ▲ ▼ FOR COMPUTING COURSEWORK ▲

▼ Challenge

Creative approaches by community college computing faculty to teaching and learning activities challenge canonical paradigms for the assessment of student outcomes, measurement of academic advancement and appraisal of career preparation.

Opportunity ▲

Computing faculty should pursue original strategies for authentic assessment to accompany innovative pedagogies and varied educational environments that contribute to a meaningful and holistic portrayal of student skills and abilities.

We need to change our assessment frameworks to accommodate more innovative pedagogical approaches that are more integrated.

K. Stout
Montgomery County Community College, PA

We're challenged to incorporate continual assessment of student learning into course and program level evaluation.

M. Semmer
Joliet Junior College, IL

▼ INNOVATING INSTRUCTIONAL ▲ ▼ MATERIALS FOR COMPUTING COURSES ▲

▼ Challenge

Conventional textbook-based approaches to instructional materials that accompany computing coursework are fraught with shortcomings, including affordability, accessibility, flexibility and currency.

We need to incorporate useful, state-of-the-art technologies into the teaching process.

J. Sands
Moraine Valley Community College, IL

Opportunity ▲

Stakeholders, including computing faculty and students, publishers and bookstores, technology manufacturers and vendors, and professional and computing accrediting organizations, should participate in prototyping innovative approaches to course and learning materials that appropriately support computing education.

This year I taught without a textbook by collecting online resources; it went well, but was very time-consuming.

K. Swarner
University of Alaska Fairbanks
Community and Technical College, AK

My 12-year-old daughter learned how to write scripts in Second Life strictly by texting other people and watching YouTube videos.

D. Green
Oracle/Sun Microsystems Inc., MO

▼ EMBRACING ANYTIME, ANYWHERE ▲ ▼ COMPUTING EDUCATION ▲

▼ Challenge

Two-year college computing faculty are challenged to remain responsive to the growing notion of “anytime, anywhere” learning now made possible by sophisticated mobile devices and widespread use of the Internet.

Opportunity ▲

Computing faculty should take advantage of the potential for symbiosis between technology tools, resources and services now readily available to students and the instructional activities, learning materials and authentic assessment techniques appropriate to computing education.

Don't ban mobile devices, engage them!

M. Qaissaunee
Brookdale Community college, NJ

We can't teach and engage mobile students the way we were taught in the classroom.

R. Blair
Miami Dade Virtual College, FL

We need to train students to learn new technologies on their own ... if they do not have that capability they will eventually be left behind.

K. Wang
Wake Technical Community College, NC

▼ KEEPING INFRASTRUCTURE CURRENT ▲ ▼ FOR COMPUTING PROGRAMS ▲

▼ Challenge

Two-year colleges are challenged to provide and maintain the teaching and learning infrastructure appropriate to computing education, including computer classroom and laboratory facilities, desktop hardware and software resources for students and faculty, mobile and distance-learning systems, and technology access.

Opportunity ▲

Community colleges should ensure that their computing education resources and facilities are on par with current industry hardware and software standards and are responsive to the needs of local business and industry, as well as to the requirements of transfer institutions. Institutions should also recognize the increasing role of non-traditional or informal learning environments and pursue initiatives that promote and foster such settings.

Keeping the technology in our labs current is quite challenging!

A. Harriger
Purdue University, IN

A faculty member reported that “the environment most successful and encouraging to my programming students is the Burger King down the road: cheap food, open all hours, free Wi-Fi, large tables and private spaces.”

K. Stout
Montgomery County Community College, PA

▼ PREPARING STUDENTS FOR THE ▲ ▼ COMPUTING CAREERS OF THE FUTURE ▲

▼ Challenge

Preparing two-year college computing graduates for jobs that do not yet exist is inherently challenging.

We are training people for technologies and jobs that do not yet exist! We have to prepare students to be able to learn on their own.

S. Pinnepalli
River Parishes Community College, LA

Opportunity ▲

Two-year college computing faculty should make certain that their graduates are prepared to adapt their computing education to an ever-changing employment environment by ensuring that their curricula and learning activities equip students with strategies and techniques for acquiring and synthesizing information. Faculty should cultivate students' independent thinking and problem-solving abilities and promote business process acumen.

A student asked me, "When you were in school, you took classes on what you're teaching us, right?" And I replied, "What I'm teaching you did not exist then! And most of what you're going to be doing in ten years does not exist now."

A. Phillips
Highline Community College, WA

The future computing professional needs deep technical and business skills, multidisciplinary expertise and the ability to deliver creative and innovative solutions to customers and clients.

K. Morneau
Capella University, MN

▼ ADDRESSING THE COMPREHENSIVE NEEDS OF EMPLOYERS ▲

▼ Challenge

Two-year colleges are challenged to produce graduates from specialized, career-oriented computing programs that satisfy employers' constantly changing needs, demands for knowledge both broad and deep, and expectations for complementary workplace skills.

As an employer, I want somebody who can do it all!

D. Bush
Inspired Synergy, NJ

Opportunity ▲

Two-year colleges should further leverage their partnerships with local business and industry to provide employers with a diverse candidate pool with computing expertise, business process awareness, a sense of professionalism, and "soft skills," including the ability to communicate and work effectively as team members.

Students need soft skills: problem-solving, thinking on the fly, communicating ideas and the ability to present a technical topic to a customer or someone other than a technician.

B. Grasser
Lakeland Community College, OH

The vast majority of the work environment is team-based ... there are very few solo jobs any more ... technology companies collaborate globally.

D. McCoy
IBM Corporation, VA

▼ RESPONDING TO COMPETING ▲ ▼ DEMANDS ON COMPUTING CURRICULA ▲

▼ Challenge

Two-year college computing faculty are challenged to keep their programs of study responsive to the extraordinary rate of technological change, to the demands of industry-based curricula and computing certifications, and to the transfer requirements of baccalaureate computing programs.

Opportunity ▲

Community colleges should pursue innovative approaches to course and curriculum design for both career- and transfer-oriented computing programs. Two- and four-year college computing faculty, industry practitioners and professional and certifying organizations should partner to craft well-defined and recognized computing program outcomes.

Today's millennial students learn differently - in snippets. Long email messages and heavily text-based online classes are just not effective for them.

R. Blair
Miami Dade Virtual College, FL

Employers value broad collections of skills, including the "soft skills" applicable to a wide range of jobs.

M. Panitz
Cascadia Community College, WA

Professional certifications are a challenge, particularly when they're vendor-specific. The question is whether or not they're valuable to our students in lieu of more general content.

A. Verno
Bergen Community College, NJ

CONTEXTUALIZING COMPUTING STUDIES

▼ Challenge

Two-year colleges are challenged to ensure that computing programs enable students to contextualize their studies.

▲ Opportunity ▲

Two-year colleges should provide opportunities for computing students to realize synergies with their mathematics preparation, participate in cross-disciplinary learning communities, engage in authentic “real-world” learning situations and gain meaningful work experiences.

It's important that students understand that people working in IT exist to fill needs actually occurring in the business world!

K. Yohannan
EMC Corporation, MA

Computing graduates need to understand business processes, because issues and solutions - from onset to end-product - exist in that context.

D. McCoy
IBM Corporation, VA

A local employer, Vicarious Visions of Guitar Hero fame, assembles artists, engineers, computer scientists and musicians together in clusters that vary with particular projects. Do we do that when educating students? No!

D. Irwin
Ballston Spa School District, NY

▼ SERVING PROFESSIONAL DEVELOPMENT ▲ ▼ NEEDS OF COMPUTING FACULTY ▲

▼ Challenge

Computing faculty face distinctly demanding professional development challenges due to the rapid innovation of hardware and software, ever-changing course content leading to accelerated obsolescence of instructional materials, the need to evaluate new technologies, requirements to keep pace with industry demands and limited opportunities for peer networking.

Faculty-to-faculty networking is important!

B. Grasser
Lakeland Community College, OH

Opportunity ▲

Educational institutions should provide multi-faceted professional development programs for computing faculty that take advantage of intra- and inter-institutional collaborations, partnerships with business and industry, and resources available from governmental, professional and certifying organizations.

When faculty experience how things are done in the “real world” it gives them a new perspective and serves as a catalyst for creativity.

B. Leitherer
The Community College of
Baltimore County, MD

We need to develop a climate where faculty collaborate about best practices and have interdisciplinary conversations.

K. Stout
Montgomery County Community College, PA

We have to figure out creative ways to deliver up-to-date professional development opportunities for computing faculty.

M. Semmer
Joliet Junior College, IL



ATTRACTING AND SUSTAINING COMPUTING FACULTY



▼ Challenge

Two-year college computing faculty are strained beyond the professional expectations of colleagues in other disciplines because computing faculty teach a disproportionate number of unique preparations and first-time courses, serve concurrent curricular demands from both local industry and transfer institutions, promote new courses and programs, and fulfill unceasing professional development obligations.

▲ Opportunity ▲

It is both critical and timely for senior administrators to direct attention to their computing faculty, given the relentless demands on these professionals and the limited number of new computing faculty. Two-year colleges should pursue initiatives that promote professional renewal for mature computing faculty, as well as incentives that attract, mentor and retain diverse, talented faculty in computing disciplines.

We need to find ways to provide faculty with time and incentives to do the necessary deep reform on a national basis and not just community college by community college.

*K. Stout
Montgomery County Community College, PA*

Administrators are challenged to keep innovative faculty motivated in an environment where non-innovative faculty members are promoted!

*M. Semmer
Joliet Junior College, IL*

▼ MEETING THE UNIQUE NEEDS OF ▲ ▼ COMPUTING DEPARTMENTS ▲

▼ Challenge

Computing departments at community colleges are distinguished by small numbers of full-time faculty, highly specialized curricula, over-reliance on the specialized expertise of part-time faculty, low enrollments in advanced courses, and continuous program and course revision.

Opportunity ▲

Senior administrators at two-year colleges must find ways to provide computing departments with support to ensure that students engage in up-to-date curricula responsive to industry needs, that knowledgeable and qualified faculty teach students, and that students can fulfill program requirements in a timely fashion.

We are so busy staying ahead of the technological curve, we don't have time to focus on instructional design!

C. Persiko
City College of San Francisco, CA

Every year the college Curriculum Committee dreads our input. This year we had 350 curriculum changes!

B. Grasser
Lakeland Community College, OH

It's important we deliver hands-on education with technologies employers demand.

A. Harriger
Purdue University, IN

▶▶▶ SUMMIT ADVISORY COMMITTEE

Robb Cutler, Board Member, Computer Science Teachers Association, CA

Ellen Hause, Program Director for Academic, Student and Community Development, American Association of Community Colleges, DC

Timothy Klingler, Professor, Computer Science, Delta College, MI

Dr. Jane Prey, Program Manager, Microsoft Research, VA

Dr. John Walstrum, President, Clover Park Technical College, WA

Dr. Vera Zdravkovich, Founding PI, CyberWatch Center, Prince George's Community College, MD

▶▶▶ ACKNOWLEDGMENTS

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▶▶▶ ABOUT THE DESIGN

Triangles are featured prominently in the design of this report. As a symbol, the triangle represents the letter Delta of the Greek alphabet, the alphabet often appearing in mathematics, the discipline underpinning computing; the Greek letter Delta also represents “change”, the emphasis of this report. As interpretive, triangles are also used as “down arrows” (challenges), “up arrows” (opportunities) and rightward-pointing arrows (going forward; the future). As iconography, the triangle evokes the graphic elements of computer flowcharting. As a three-pointed mark, the triangle reflects the three-prong mission of a community college: education for entry into a career, education for transfer to a university, education for life-long learning.

— Sherrie Morse

▶▶▶ SUMMIT PARTICIPANTS

(* denotes panelist)

Andrew Bird, *Dean of Instruction, Clover Park Technical College, WA*

Dr. Risa Blair, *Professor, Senior Instructional Designer, Miami Dade Virtual College, FL*

Dennis Bush, *President, Inspired Synergy, NJ*

Dr. Lillian (Boots) Cassel, *Professor, Villanova University, PA; ACM Education Board*

Dr. Becky Grasser*, *Professor, Lakeland Community College, OH*

Daniel Green*, *Senior System Engineer, Oracle/Sun Microsystems Inc., MO*

Dr. Scott Grissom, *ATE Program Director for DUE, National Science Foundation, DC*

Alka R. Harriger*, *Professor and Associate Department Head, Purdue University, IN*

Rose Hopkins, *Teacher, Naperville North High School, Naperville, IL*

Diane Irwin, *K-12 Science Coordinator, Ballston Spa School District, NY*

Barbara Leitherer, *Associate Professor, Mathematics, The Community College of Baltimore County, MD*

Donald L. McCoy*, *HR Diversity Delivery Program Manager, Retired, IBM Corp., Human Resources, VA*

Shirley Miranda*, *Teacher and Math Department Chair, Morse High School, San Diego, CA*

Dr. Keith A. Morneau*, *Faculty Chair, Information Technology, Capella University, MN*

Brenda Oldfield, *Director, Cybersecurity Education and Workforce Development, Department of Homeland Security, National Cyber Security Division, DC*

Michael Panitz, *Senior Founding Faculty, Software Programming, Cascadia Community College, WA*

Myra Pelz, *Academic Program Chair, Rochester Institute of Technology National Institute for the Deaf, NY*

Craig Persiko, *Instructor, Computer Science; Co-PI, Mid-Pacific Information and Communications Technologies Center, City College of San Francisco, CA*

Amelia Phillips, *Chair, Pure and Applied Science Division, Highline Community College, WA*

Savitha Pinnepalli, *Instructor, Computer Science, River Parishes Community College, LA*

Michael Quissaunee*, *Professor, Engineering & Technology, Brookdale Community College, NJ*

Dr. John Sands, *Executive Director of the Midwest Cisco Area Training Center; Co-PI NSF/ATE Regional Center for System Security and Information Assurance, Moraine Valley Community College, IL*

Judith Scheeren, *Professor, Computer Technology, Westmoreland County Community College, PA*

Dr. Cheryl Seals, *Associate Professor, Computer Science and Software Engineering, Auburn University, AL*

Dr. Margaret Semmer*, *Dean of Career and Technical Education, Joliet Junior College, IL*

Dr. Karen A. Stout, *President, Montgomery County Community College, PA*

Jody A. Strausser, *Assistant Professor, Modeling & Simulation, Tidewater Community College, VA*

Keith Swarner, *Associate Professor, Computers, Information and Office Systems, University of Alaska Fairbanks, Community and Technical College, AK*

Joseph “Smokey” Trujillo Jr., *7 – 12 Teacher and Department Head, Santa Fe Indian School, NM*

Anita Verno, *Associate Professor and Department Chair, Information Technology; CSTA Board member, Bergen Community College, NJ*

Dr. Jessie J. Walker, *Assistant Professor and Coordinator, Computer Science, University of Arkansas at Pine Bluff, AR*

Dr. Kai Wang, *Department Head, Computer and Engineering Technologies, Wake Technical Community College, NC*

Kim Yohannan*, *EMC Academic Alliance Manager, EMC Corporation, MA*



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