ACM Education Board

Annual Report for FY 12

September, 2012

Contents

Executive Summary

1. Summary of FY 2012 Activities
   1.1 Education Board Strategic priorities
      1.1.1 Strategic Objectives
      1.1.2 Current Priorities
   1.2 Education Council activities
      1.2.1 Updating the membership of the Education Council / Board
      1.2.2 Education Council meetings
   1.3 The Future of Computing Education Summit
      1.3.1 PACE – Partnership for Advancing Computing Education
   1.4 Supporting K-12 computing efforts
      1.4.1 Developments involving AP
      1.4.2 The CS 10k challenge
      1.4.3 Additional considerations
   1.5 Report from the Committee for Computing Education in Community Colleges (CCECC)
   1.6 Updating the computing curricula guidelines
      1.6.1 General strategy
      1.6.2 Computer science – towards CS 2013
      1.6.3 Two-year College IT activity
      1.6.4 Computer Engineering and Software Engineering
   1.7 Master’s degree initiatives
      1.7.1 Master’s report
   1.8 International activity
      1.8.1 European efforts
      1.8.2 Developments related to India
   1.9 Improving Understanding of the Computing Education Landscape
   1.10 Promoting new curricular themes and strategies
   1.11 Enhancing the effectiveness of the Education Board and Education Council
   1.12 Technology and Tools Task Force

2. Priorities for FY 2013
   2.1 Review of priorities of the Board
   2.2 Forthcoming Education Council activities
   2.3 Supporting K-12 efforts
   2.4 Plans of the Committee for Computing Education in Community Colleges
   2.5 Undergraduate curriculum efforts
   2.6 Masters guidance on Information Systems
   2.7 Extending the leadership role
   2.8 International activity
   2.9 PACE – moving forward
   2.10 Promoting new curricular themes and strategies
      2.10.1 Online learning
      2.10.2 Cyber security education
   2.11 Continuing to foster a positive image of computing
   2.12 Increasing visibility within the community

Annex A Roster of Education Board and Education Council members
Annex B Final Report on CCECC IT Curriculum Guidance Project
Executive Summary

This report summarizes the activities of the ACM Education Board and the Education Council in FY 2012 and outlines priorities for the coming year. Major accomplishments for this past year include the following:

- Making substantial progress on each one of the immediate priorities that the Education Board and the Education Council had deemed as important. The latter included supporting the ongoing development of CS 2013, supporting the AP initiative and the related CS10k challenge, supporting an initiative in computing education with ACM India and addressing issues on statistics gathering (extending Taulbee).
- Supporting the ongoing evolution and ultimate launch of PACE (Partnership for Advancing Computing Education).
- Supporting K-12 activity and the Two-Year College Education Committee, the latter now being referred to as the Committee for Computing Education in Community Colleges (CCECC for short)
- Having oversight of the setting up of two separate committees to take forward the TauRus project and the CS 10k challenge
- Supporting work on CS 2013, the new computer science curricular guidelines
- Holding an Education Council meeting immediately after the Turing celebrations in San Francisco at which a major panel session was held on online learning
- Making a submission to the National Science Foundation (NSF) regarding education in cyber security
- Completing a master’s degree report on master’s-level curricular guidance
- Completing an investigation into the desirability of embarking on reviews of the current Software Engineering and Computer Engineering volumes, namely SE 2004 and CE 2004, and initiating follow-up activity
- Broadening international participation in computing education activities; in particular the Education Board set in motion discussions between SIGCSE and Informatics Europe about initiating a new high profile annual computing education conference in Europe
- Continuing the work on reversing declining enrollments in computing disciplines and in the process fostering a positive image of computing among young people
- Continuing to enhance the effectiveness of the Education Board and the Education Council
- Increasing the visibility of the Education Board and the Education Council within the community
- Agreeing to certain time limits for membership of the Education Board

Challenges for FY 2013 include further development of many of last year’s activities:

- Given the progress that has been made over the last 12 months, it seems timely to initiate a review of the current priorities of the Education Board and the Education Council
- Continuing to evolve arrangements associated with the development of both the Education Board and the Education Council including their membership
- Continuing to support the development of CS 2013, leading to its publication in 2013
- Continuing to support K-12 activity and the related CS10k challenge
- Increasing international activity, and in particular progressing an initiative with ACM India and supporting any new computing education conference in Europe
- Supporting the Committee for Computing Education in Community Colleges and in particular its IT initiative
- Supporting the launch and the further development of PACE
- Supporting the interim reviews of publications in both software engineering and in computer engineering in conjunction with the Computer Society
- Launching a review of the Information Technology guidelines in conjunction with SIGITE; the opportunity will also be taken to undertake a study of the wisdom of having separate IT and IS volumes – this will need to involve the Education Board, AIS and SIGITE
- Investigating a request to launch a Masters level review of guidance on Information Systems
- Increasing web-based support for the community to keep them more involved with curriculum development
- Continuing to support steps to gather statistics for all computing institutions,
- Further extending the leadership role of the Education Board and the Education Council
Section One

Summary of FY 2012 Activities

1.1 Education Board strategic priorities

It seems relevant to begin with some background about the Education Board and the Education Council to provide some context for its activities.

At the ACM Council meeting in October 2010 there had been considerable discussion about many aspects of computing education. It was suggested that the Education Board might give find benefit in giving consideration to the identification of a set of strategic priorities for their work. The Education Board duly considered this at its meeting in Seattle on 10th and 11th December 2010.

Any discussion about strategic priorities had to be seen in the context of the Charter of the Education Board, namely

*The ACM Education Board – its Charter*

**Scope**

The general scope of the Education Board is to promote computer science education at all levels and in all ways possible. The Board will be an executive-like committee overseeing the Education Council and will initiate, direct, and manage key ACM educational projects. This includes activities such as the promotion of curriculum recommendations, the coordination of educational activities, and efforts to provide educational and information services to the ACM membership.

The Board will oversee the work of the Education Council. This body will include representatives of all ACM committees concerned with accreditation, curricula, aid to educational institutions, and other educational activities.

1.1.1 Strategic objectives

The following were identified as strategic objectives for the Education Board (and these were later agreed to by the Education Council at its meeting in Miami in February 2011):

- To provide a focus for ACM activity and leadership in the general area of computing education
- To support ACM’s strategic objectives through activities and initiatives in computing education; this includes providing support for ACM’s various Councils
- To understand the education related needs and aspirations of ACM members – students, academics, practitioners (and their managers) and employers - and to respond appropriately on behalf of ACM
- To provide leadership for the computing community in curricular development and curricular guidance; the community is to include all levels of education (specifically including K-12 and Two-Year College activity) with the emphasis being on higher education
- Where possible to act on behalf of the computing community to increase the status and standing of computing education
- In recognizing ACM’s role as an international organization, to understand the differing needs of the international community and to address these in Education Board and Education Council considerations
- To organize and manage meetings of the Education Council, to keep the Council members up-to-date with significant developments and generally to manage the work of the Council
- To approve ACM appointments to education-related bodies such as ABET, and to keep informed about and engage in significant related activity

1.1.2 Current priorities

At the Seattle meeting of the Education Board, it was further agreed that there was a need to provide a focus for current activity. It identified the following as priority areas
• The effort to produce the next Computer Science volume, referred to as CS 2013
• The Advanced Placement initiative and the related CS10k challenge, i.e. the challenge of producing for the US 10k teachers properly qualified to teach to the new curriculum
• Certain international initiatives and in particular an initiative involving ACM India was being considered

It was also felt that thought should be given to gathering statistics about the uptake and state of computing in all institutions of higher education; currently the Taubbee report addresses this but only for selected (the top research) institutions.

1.2 Education Council activities

1.2.1 Updating the membership of the Education Council / Board

The Education Board and the Education Council have been in existence now since 2006. In its present incarnation, the Education Council is internal to ACM and contains representatives of all significant educational interest within ACM. Thus:

• All members of the Education Board are automatically members of the Education Council
• Those SIGs with significant educational activity have a formal representative on the Education Council (SIGCSE, SIGITE, SIGGRAPH, SIGCHI, SIGPLAN, SIGCAS)
• There are representatives of CSTA, the Two-Year College Education Committee, the Education Policy Committee
• Industry representatives
• Certain ABET representation is included
• Certain people are included because of the distinctive contribution they make to computing education (e.g. NSF Distinguished Educators)
• Additional SIGs and other representatives are included

In making decisions about the phrase “significant educational activity,” activity such as an education strand or theme within an annual conference would qualify, or the existence of an education officer. For this purpose Lillian Israel’s activity chart could be referenced. Following a certain updating, the membership of the updated Education Council is included in Annex A.

Membership of the Education Board itself had to be addressed. The Education Board has now taken the decision that membership of the Board should be limited to at most two terms of three years.

1.2.2 Education Council meetings

In accord with the arrangement (entered into at the EC budget meeting in February 2007) that there should be one Education Council meeting every eight months approximately, there were two meetings of the Education Council in FY 2012. Education Council meetings normally benefit from updates on: what is happening within ACM, usually from John White; activities of the Computer Education Policy Committee, usually from Cameron Wilson; actions and initiatives taken over the previous eight months by the Education Board itself; reports on major projects such as those associated with the current priorities of the Board; and reports from the various SIGs, from CSTA, from ABET. But these are complemented by some significant discussion items.

Denver meeting

The ninth meeting of the Education Council took place at the Magnolia Hotel in Denver on 16th and 17th of September 2011. The main thrust of this meeting was a series of talks and related discussions (including group discussions) aimed at making substantial progress on the current priorities of the Education Board / Council. In addition:

• In support of statistics gathering, Jodi Tims gave a presentation on her work on TauRus, activity that was a follow up to earlier work by Michael Goldweber
• In support of the ongoing CS 2013 project, Mark Stehlik gave a talk on National Standards and another on the Carnegie Mellon curriculum v2.0
• Debra Richardson gave a talk on CSEdWeek

San Francisco meeting

Following the Turing celebrations, the tenth meeting of the Education Council was held on 18th and 19th June 2012 in the Palace Hotel in San Francisco. Two matters dominated the agenda: the CS 2013 project; and, a panel discussion on online learning.

The motivation behind the focus on CS 2013 was that the Strawman version of the CS 2013 report had been produced and comments sought by end of July 2012. This meeting was seen as an ideal opportunity for the Education Council to focus on that report and provide feedback to be used by the project team in moving towards a final report. It is perhaps worth noting that this was the first occasion on which such curricular guidance would be produced in the context of the Education Council.

Within the community considerable interest had arisen in online learning. Given the role of the Board and the Council, it would be important to air many of the ideas and controversies, and to consider how these might support the various priority areas of the Board / Council. Potentially they could have considerable impact. In advance of the meeting it was considered desirable that a White Paper should be produced; this should capture the discussion and provide a view on the role of online learning within the ACM. At the Council meeting the catalyst for the online learning discussion was an Online Learning Panel, chaired by Mehran Sahami. The panelists included: Woodie Flowers (MIT), Candice Thille (CMU), John Mitchell (Stanford), Peter Norvig (Google) and David Patterson, (UC Berkeley). Each panelist gave a brief presentation and this was followed by lively discussion period. The general conclusion was that it had been a privilege to be present at this discussion.

1.3 The Future of Computing Education Summit

The Future of Computing Education Summit (FoCE) took place in June 2009 and the report on this appears at: http://www.acm.org/education/future-of-computing-education-summit/

At this meeting there was encouragement for a proposed new body to focus on information gathering, coordinating, connecting, and encouraging but not to take on responsibility for such matters as curriculum development. It would also subsume all the action items emerging from the FoCE itself.

1.3.1 PACE – Partnership for Advancing Computing Education

At an inaugural meeting in Washington DC on 26th April 2011, PACE came into being (previously it had been referred to as CECC, the Computing Education Coordinating Committee). The member organizations present were ACM, the Association for Information Systems (AIS), the Computer Society (IEEE CS), the Computer Science Teachers Association (CSTA) and the National Center for Women & Information Technology (NCWIT). Harriet Taylor and Joe Urban were also present as representatives of NSF. From the ACM John White, Cameron Wilson and Andrew McGettrick were present as well as Mark Guzdial, Heikki Topi and Jane Prey – the latter three had done much of the background preparatory work in conjunction with Tom Hilburn from IEEE Computer Society. There was general agreement by all attending organizations (ACM, AIS, CSTA, IEEE-CS and NCWIT) on the purpose, structure and start-up activities for PACE. However, there were some items needing further interaction and settlement.

All five of the present institutions agreed to be founding members of PACE. The Administrative Director would be Mark Guzdial and he would have responsibility for coordinating the growth and development of PACE. The chair of the PACE Board of Directors (one from each of the five founding organizations) would be Lecia Barker (NCWIT) with Andrew McGettrick (ACM) as Vice-Chair.

To provide a brief overview of PACE:

• Goals and Objectives
  o High quality, diversity, and capacity of the computing workforce
  o High quality of computing education at all levels
Increased stability of enrollments at levels compatible with demands

- Membership provides opportunities to
  - Advance the state of computing education
  - Share strategies and innovations
  - Build partnerships to support and enhance current and new initiatives
  - Reduce expense and increase impact

Since that initial meeting CRA-e has joined PACE. A subsequent meeting of the PACE Board took place at the CRA-e offices in Washington DC on 7th and 8th May 2012. Present at the Meeting were: ACM: Andrew McGettrick (Vice-Chair) and Heikki Topi; AIS: Pete Tinsley and Jason Thatcher; CRA: Andy Bernat; CSTA: Chris Stephenson; IEEE CS: Ann DeMarle and Angela Burgess; NCWIT: Lecia Barker (Chair). There were three speakers: Cameron Wilson, talking about policy and what ACM is doing; Lauren Csorny, talking about BLS projections and giving information about breakdowns of occupation types, how these have changed, and how they go about making the projections; and Elizabeth Grossman from Microsoft, talking about what MS is doing in the education policy area. Each presentation included lots of questions and answers as well as discussion.

At that meeting possible collaborations were discussed including the Computer Society becoming involved in CS Ed Week and AIS exploring joining Computing-in-the-core. The funding from NSF, which is residue from the original FoCE support, has been extended for another year and each organization contributes $1,000 annually to cover meeting expenses.

1.4 Supporting K-12 computing efforts

1.4.1 Developments involving AP

The ongoing discussions about the AP Computer Science exams are important for computing in the U.S. A new AP CS Principles course curriculum has been devised, has undergone Phase I piloting, and is now undergoing Phase II piloting. See http://csprinciples.org/ The Principle Investigator on this is Owen Astrachan from the Education Council but the work generally is supported by other members of the Education Council, in particular Mark Guzdial, Dan Garcia, Deepak Kumar, Eric Roberts, Larry Snyder and Chris Stephenson. Jan Cuny (Education Council) has been a key player in guiding and promoting these developments.

Following the initial piloting, the College Board sought attestations from universities, in support of the new exam and the outcome of this would be crucial to the ongoing work and the wider acceptability of the new exam. This was very successful with the Education Council playing a vital role in making this happen.

1.4.2 The CS 10k challenge

The challenge of supporting the development of 10k teachers and equipping them to be able to teach the new CS Principles course is vital to the success of the ongoing developments at high school level. During the year funding was obtained from NSF and Google to help with this. Now a committee composed of Jan Cuny, Dan Garcia, Mark Guzdial, Eric Roberts, Larry Snyder, Cameron Wilson and Chris Stephenson has been set up to take this forward.

1.4.3 Additional considerations

Fostering a positive image of computing among young people

One of the factors that had contributed to the enrollment crisis was that young people did not see existing programs of study in computing as being sufficiently attractive or offering attractive career opportunities.

Grady Booch had given an inspiring keynote address at SIGCSE 2007, in which he talked about the need to rediscover the wonder and awe of computing and to make its joys more evident to the next generation. At SIGCSE 2008 in Portland, at SIGCSE 2009 in Chattanooga, at SIGCSE 2010 in Milwaukee, at SIGCSE 2011 in Dallas, Texas, and again at SIGCSE 2012 in Raleigh, North Carolina members of the Education Council (led by Dan Garcia from the Education Board) have put forward submissions for special
panel sessions that would build on this. Their sessions on the general topic of *Rediscovering the Passion, Beauty, Joy and Awe: Making Computing Fun Again* have attracted considerable audiences and they were typically deemed to be one of the successes of these conferences.

**Curriculum considerations**

It has seemed clear that any action plan related to computing education needs to include a campaign of some kind to foster positive images of the discipline among young people. That campaign would have to involve developing new curricular offerings that hold greater appeal and greater promise. Individual members of the Education Board / Council have developed ideas in this regard and they are experimenting in order to gain a better understanding of the factors that shed light on the situation or contribute to success. The metrics for success in this endeavor must include both increased admissions and increased retention rates in degree programs.

1.5 Report from the Committee for Computing Education in Community Colleges

Dr. Elizabeth K. Hawthorne provided the following report on the activities of the ACM Committee for Computing Education in Community Colleges (CCECC).

**CCECC MEMBERSHIP:**

Members
- Elizabeth K. Hawthorne, CCECC Chair; Senior Professor, Union County College; ehawthorne@acm.org
- Robert D. Campbell, CCECC Vice-Chair; VP for IT, CUNY Graduate Center; rcampbell@gc.cuny.edu

Associate Members
- Becky Grasser, Department Chair, Lakeland Community College, OH
- Anita Verno, Associate Professor, Information Technology, Bergen Community College, Paramus, NJ
- Deborah Boisvert, Executive Director, BATEC Center for IT, University College, University of Massachusetts Boston, MA
- Robert Deadman, Asst Vice-President of Business, Computing Technology and Logistics, Ivy Tech Community College, Indianapolis, IN
- Margaret Leary, Professor, Information Technology, Northern Virginia Community College, Annandale, VA
- Dan Myers, Academic Programs Manager, Citrix Systems, Inc., Castle Pines, CO
- Lance Perez, Professor, Electrical Engineering, University of Nebraska, Lincoln, NE
- Michael Qaissaunee, Associate Professor, Engineering & Technology, Brookdale Community College, Lincroft, NJ
- Jason Wertz, Assistant Professor, Computer Science, Montgomery County Community College, Blue Bell, PA
- Kim Yohannan, Academic Alliance Manager, EMC Corporation, Franklin, MA
Emeriti Members
- Dr. Karl Klee
- Dr. John Impagliazzo
- Dr. Joyce Currie Little
- Dr. Dick Austing

PURPOSE:
The Committee charter and purpose is as follows. The ACM Committee for Computing Education in Community Colleges 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 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 CCECC achieved the following milestones in FY11 (July 1, 2011 – June 30, 2012):
- Completed investigation phase (phase 1) of the associate-degree Information Technology (IT) project with recommendations to the ACM Education Board.
  - Appointed phase 1 working group members
  - Conducted in-person meeting with working group
  - Conducted monthly conference call with working group
  - Presented preliminary findings to ACM Education Council – September 17, 2011
  - Completed written report with recommendations for consideration by the ACM Education Board – January 19, 2012
- Establishment of CCECC Affiliate database, in support of outreach for phase 2 of our IT initiative.
- Visited the NSF ATE Convergence Technology Center at Collin County Community College in Plano, TX (near Dallas) as part of ongoing research for our IT initiative - www.connectedtech.org.
- Engaged in discussions with BATEC leadership in support of our IT initiative. BATEC is the NSF national center for Information Technology with the charge of “Transforming Education for the 21st Century IT Professional” – www.batec.org.
- Engaged in various discussions with colleagues and review of materials from other settings outside USA in support of our IT initiative.
- Continued participation on the CS2013 steering committee curricular development initiative, serving as chair of the SP KA and member of the new IAS KA.
- Continued participation on the ACM Education Policy Committee and other advocacy efforts on behalf of computing education in the community college sector.
- Appointed to ACM-W council - women.acm.org/who_we_are/council_ec.cfm
- Continued online survey of TYC computing faculty and programs
- Ongoing development and maintenance of CAP Space, an online repository of curricula, assessment and pedagogy resources – www.capspace.org. CAP Space was migrated to a “cloud” hosting service. We established “online communities” with a presence in Ensemble (NSDL computing portal) and incorporation with CAP Space. We also established a presence in Facebook with a designated Associate Member, Dr. Becky Grasser. Promoted Pledge of the Computing Professional via CAP Space. Promoted CSTA’s new learning standards and membership via CAP Space. Promoted Technical Report from CMU Software Engineering Institute “Software Assurance Curriculum Project Volume IV: Community College
Education” via CAP Space.

- Supported Computer Science Education Week by collaborating with CSTA colleagues to produce a poster with CS- and IT-related associate-degree programs. This poster was disseminated nationally in support of CS Ed Week 2011.
- Ongoing communication and outreach efforts with Chris Stephenson, Executive Director of CSTA – www.csta.acm.org
- Continued dissemination of the report of findings from the Strategic Summit on the Computing Education Challenges in Community Colleges – www.capspace.org/summitreport
- Collaboration with colleagues and dissemination of information through participation in a variety of conferences, including the SIGITE 2011 (West Point), SIGCSE 2012 (Raleigh), CISSE 2012 (Orlando), and MPICT (2012) that includes a YouTube video re: IT initiative - www.youtube.com/watch?v=aFBLAR6xkNU.
- Communication with colleagues via a featured column in the ACM Inroads publication, Community College Corner – columns available through CAP Space at www.capspace.org/committee/projects.aspx
- Support for the goals and objectives of the ACM Education Council and Board through a variety of synergistic activities.

1.6 Updating the computing curricula guidelines

With five volumes of curricular guidelines now published as well as an Overview volume, it was necessary to demonstrate ACM’s commitment to keeping these curricular models up-to-date. The following subsections offer additional comments about how that work proceeded in each of the major areas.

1.6.1 General strategy

Within the Education Board there had been a dialogue on whether the current five-volume strategy employed within CC 2001 remains appropriate. The concept of the five-volume series has now received acceptance within the community and has had a considerable impact. To alter this too soon would be risky. It could have the possible effect of creating unnecessary confusion at a time when these ideas are becoming accepted. Accordingly, it was felt that the five-volume idea should be retained for the next few years at least.

1.6.2 Computer science – Towards CS 2013

The CS 2013 work is a joint activity involving ACM and the IEEE Computer Society, with ACM taking the lead in line with an agreed memorandum of Understanding between ACM and the Computer Society. Work on this has proceeded apace under the leadership of Mehran Sahami (Stanford) and Steve Roach (UT, El Paso). The following notes are heavily based on slides, etc. from the CS 2013 group.

A Steering Committee is in place; it consists of

ACM
Mehran Sahami, Chair (Stanford)
Andrea Danyluk (Williams College)
Sally Fincher (Univ. of Kent, UK)
Kathleen Fisher (Tufts University)
Dan Grossman (Univ. of Washington)
Beth Hawthorne (Union County Coll.)
Randy Katz (UC Berkeley)
Rich LeBlanc (Seattle Univ.)
Dave Reed (Creighton)

IEEE-CS
Steve Roach, Chair (UT, El Paso)
The Education Board had agreed to a charter with the Steering Committee, namely:

To review the Joint ACM and IEEE/CS Computer Science volume of Computing Curricula 2001 and the accompanying interim review CS 2008, and develop a revised and enhanced version for the year 2013 that will match the latest developments in the discipline and have lasting impact.

The CS2013 task force will seek input from a diverse audience with the goal of broadening participation in computer science. The report will seek to be international in scope and offer curricular and pedagogical guidance applicable to a wide range of institutions. The process of producing the final report will include multiple opportunities for public consultation and scrutiny.

In their early work, the Steering Committee sent out a questionnaire (December 2010) to some 1500 US department chairs/directors of undergraduate education and around 2000 international departmental chairs to gather views and to gain reactions to earlier curricula efforts, in particular CS 2001 and the interim volume CS 2008, but also to receive suggestions for new topics and knowledge areas. Some 201 responses were received.

To stimulate and encourage community involvement presentations and discussions have been held at FIE-11 in October 2011, SPLASH in October 2012, UCFCS in November 2011, SIGCSE-12 in March 2012, LACS in June 2012, CRA Snowbird in July 2012 and presentations are planned for COMTEL Peru in October 2012 and FIE-12 also in October 2012.

The outline of the planned report is as follows:

- Guiding principles
- Body of knowledge
  - Topically organized set of “Knowledge Areas”
  - Knowledge Areas provide list of topics and learning outcomes
- Curricular structure
  - Guidance on how Body of Knowledge translates into curriculum
  - Institutional challenges
- Professional considerations
  - Characteristics of CS graduates
  - Professional practice
- Course and curricular exemplars
  - Pointers to and discussion of example curricula/courses reflecting diverse ways of covering the Body of Knowledge

The planned schedule envisaged for the production of the final CS 2013 report is seen as:

- February 2012: Strawman draft (alpha) of CS2013, public release
  Includes body of knowledge, characteristics of graduates
  Circulate for comments to community
- July 15th: 2012 Comment period for Strawman closes
  Continue incorporation of feedback
  Further hone report
- February 2013 Ironman draft (beta) public release
1.6.3 Two-year College IT Activity

There has been a wish in the community to press ahead with a two-year college volume on IT. The CCECC formed a group to undertake preliminary work on producing recommendations on how to proceed. The plan for the Development of Associate-Degree IT Curricular Guidelines is set out below:

The proposed IT curricular guidelines envisions IT education and skills in the context of curricular pathways within various career domains and identifying forward-looking curricula, assessment and pedagogy that serves the targeted audience. The proposed IT curricular guidelines would be influenced and formulated by a broad-based consortium of participants.

Phase I – Research for associate-degree IT guidelines

Deliverables: report of preliminary investigation to the Chair of the ACM Education Board. Participants include: CCECC members; representatives from NSF ATE centers, SIGITE, IEEE-CS, Canadian Information Processing Society (CIPS); business, industry and government.

Inputs include:
- The associate-degree curricular guidelines from 2000 at www.capspace.org/committee/CommitteeFileUploads/acmguide.pdf, which recognizes three different IT tracks: networking services, Internet/web services, and user support services
- ACM IT volume (www.acm.org/education/curricula/IT2008%20Curriculum.pdf); draft two-year IT guidelines from SIGITE
- “Digitally Enhancing America’s Community Colleges: Strategic Opportunities for Computing Education,” report of findings from NSF/ACM Strategic Summit (www.capspace.org/summitreport)
- Reports on CCECC visits to many NSF ATE centers, including ICT Center, BATEC, MPICT, CyberWatch, CSSIA, CSEC, NWCET (www.nsf.gov/news/news_summ.jsp?cntn_id=108192)
Process:

- The CCECC is gathering information on IT programs offered in community colleges, such as networking, cyber security, game development and web development. See www.acmccecc.org/survey.
- Use a variety of modern collaboration and communication strategies for this consultation: web/email communication, surveys, individual academic and industrial contacts, etc.
- Collect information and opinion from the principal curriculum stakeholders (industry and academia) about the need for a CCECC IT volume (BOK, curriculum architecture, pedagogy, infrastructure, etc.). Of particular interest would be
  - the extent to which CCECC courses in information technology possess meaningful articulation pathways with 4 year college programs, and
  - the collection of information and opinion about the value and usefulness of the four-year volume in the community college setting.
- Analyze and assess the results of this research activity.
- Prepare a report that describes the process, analysis and assessment of the information collected and makes recommendations concerning the following:
  - The type and extent of guidance needed for CCECC IT programs
  - An estimate of the amount of effort and a proposed schedule
  - Commentary on the extent to which articulation with the four year IT volume is desirable

Phase II – Development of associate-degree IT guidelines

Deliverables: two iterative drafts (Strawman and Stoneman) with community review to produce the final curricular guidelines

Process: with approval from the ACM Education Board:

- Recruit appropriate participants for this curricular development effort based upon Phase I findings.
- Develop initial draft (Strawman) for community review.
- Incorporate this initial feedback to develop next version (Stoneman) for further community review.
- Incorporate this final feedback to produce the final curricular report.
- Disseminate associate-degree IT guidelines.

Phase I of this is completed and the final report is included in Annex B.

1.6.4 Computer Engineering and Software Engineering

The question had arisen about updating curricula guidance published in 2004, for both Computer Engineering (CE) and Software Engineering (SE). Two small teams, joint with the Computer Society, were set up to consider the usefulness and desirability of undertaking such an exercise. A charter for each was agreed with the Education Board and the teams were asked to report in a relatively short space of time.

The initial CE Review Task Force consisted of

Computer Society: Eric Durant (Milwaukee School of Engineering, lead), Mitch Thornton (SMU) and Tim Wilson (ERAU)

ACM: Susan Conry (Clarkson University), John Impagliazzo (Hofstra University) and Andrew McGettrick (University of Strathclyde)

The initial SE Review Task Force consisted of

Computer Society: (lead) Mark Ardis, (Stevens Institute of Technology), Greg Hislop (Drexel University), Mark Sebern (Milwaukee School of Engineering)
Both groups concluded that a modest update of the curricula were desirable. Such an update should take account of the CS 2013 developments to ensure currency. To undertake the work, the CE Review team would continue their work but the team undertaking the SE work would consist of following:

Computer Society: (lead) Mark Ardis, (Stevens Institute of Technology), Greg Hislop (Drexel University), Mark Sebern (Milwaukee School of Engineering)
ACM: Dave Budgen, University of Durham, UK
Jeff Offutt, George Mason University
Willem Visser, representing SIGSOFT

1.7 Master’s degree initiative

1.7.1 Master’s report

Part of the motivation behind this initiative has been the attention being given to master’s programs in many countries. In Europe, for instance, the Bologna agreement has spawned considerable interest in and attention to master’s programs. However, worldwide, there is ever-greater attention to the effectiveness of degree programs and to mutual recognition of qualifications across the globe. Given the ACM leadership position in computing education, it was deemed important that ACM should seek to provide guidance in this area.

This Masters initiative was a joint activity involving members of the Education Board and Education Council working with members of the IEEE Computer Society. The team involved was: Lillian Cassel (chair), Michael Caspersen, Gordon Davies, Art Pyster, Kevin Scott, and Heikki Topi.

The report was considered at a meeting of the Education Council and received very positive feedback. A small number of matters had to be addressed. This has now been completed.

1.8 International activity

1.8.1 European efforts

Computing education conference

The Informatics Education Europe series of conferences had stalled as a result of an effort to host a meeting in 2010 in Rome; the number of papers elicited was below the threshold needed to proceed. The Education Board sought to re-launch these conferences through the auspices and with the support of ACM Europe.

At a meeting between ACM Europe and Informatics Europe (the latter being essentially a group formed from the heads of Computing departments throughout Europe) there was discussion about computing education in Europe and agreement that there was a need for a high profile and highly prestigious computing education conference in Europe. This would serve to pull together the computing education community within Europe and provide a much-needed forum for exchanging views and experiences as well as tracking new developments.

This has now been raised with SIGCSE, who had responsibility for ITICSE; it was important not to have conflict with ITICSE and to have an event that was European in character. A joint committee between SIGCSE and Informatics Europe has been formed to take this forward.

The attention of SIGCSE has also been draw to the fact that, as well as ACM Europe there was ACM India and ACM China and these Councils may wish to host similar conferences.

Monitoring activity

Members of the Board / Council have also been involved in:
• monitoring the activities of Informatics Europe. It should be noted that ACM Europe and Informatics Europe are collaborating on producing guidance on computing in schools in Europe.

• keeping a close eye on accreditation developments within Europe. There has been an EU funded project called the Euro-Inf project managed by ASIIN in Germany with main partners the University of Paderborn and the University of Applied Sciences in Hamburg in Germany and involving CEPIS in Brussels. The main purpose of this project has been to devise criteria for the accreditation of degrees in Informatics across Europe, both at the undergraduate level and at the master’s level. Education Board / Council members were involved in this in an international advisory capacity and were present at the major meetings. This has given rise to EQANIE, the European Quality Assurance Network in Informatics Education and the work of that is being based on the outputs from Euro-Inf.

• monitoring activity associated with the Seoul Accord. A number of countries (South Korea, US, UK, Canada, Australia and Japan) have been developing criteria for the mutual recognition internationally of accreditation activity. This was intended to mirror for informatics the Washington Accord for engineering. The groups originally involved were: the Accreditation Board for Engineering Education of Korea, ABET, the BCS in the UK, the Canadian Information Processing Society, the Australian Computer Society and the Japan Accreditation Board for Engineers. At the first general meeting of the Accord held in meeting in Kyoto, Japan on 20th June 2009, two additional members were added: the Hong Kong Institution of Engineers and the institution of Engineering Education Taiwan. Importantly Joe Turner, member of the Education Council, acts as its chair and informs the Education Council of relevant developments.

• following an initiative from the Education Board, Bobby Schnabel, chair of ACM’s Education Policy Committee, was invited to make a presentation at the AGM of the Council of Professors and Heads of Computing in the UK (in Belfast on 19th April, 2011) on pre-university computing. The Royal Society in London has now published its report on computing in schools in the UK – see http://royalsociety.org/education/policy/computing-in-schools/report/

1.8.2 Developments related to India

Following discussion, a proposal had been received from ACM India (via Mathai Joseph, former ACM Council member) seeking support from the Education Board for activity that would contribute towards the improvement of CS education in India. That would be a considerable undertaking, given the size and scale of the problems.

In view of the nature of this, the resource implications and ACM’s other links with ACM India, the Education Board involved John White in these discussions. Much thought had to be given on the right way for ACM to proceed and this would take time.

Mathai and his colleagues from ACM India had a clear-ish view of what they want, and saw their ideas developing initially through discussions locally (i.e. locally within India, and even within a set geographic region within India). In part this stemmed from the fact that they would have to get buy-in locally, e.g. from those who may help with assessment and tutoring, and employers who needed to use these courses as an extra differentiator of applicants for employment.

They also saw the material as supplementary in some sense, and not conforming to conventional ideas on course development. Five courses had been identified: introduction to programming, functional programming, modern automata theory, machine learning / data mining, foundation of systems. Initial thinking was to use slides with voice-over; note that account had to be taken of infrastructure.

To progress this initiative, an education workshop was held in India for January 2012. Representatives from ACM included the President, Alain Chenais, John White, and Andrew McGettrick. The intention was to hold detailed discussions on how to proceed. In the event the developments in online learning overshadowed all else and it was felt necessary to pursue these developments to ascertain their
relevance to the ACM India initiative.

Representatives from ACM India have now been invited to all recent Education Council meetings in order to explain their latest thinking.

1.9 Improving Understanding of the Computing Education Landscape

An important role for the Ed Board is to improve our understanding of the computing education landscape, not just in the US but globally. This helps to inform the Board and suggest areas of need and even priority.

Within certain institutions in the US there have been some very positive indicators of expanding enrollments. In part, evidence comes from the CRA Taulbee Survey. The Survey is conducted annually to document trends in enrollment, etc and it covers computer science, computer engineering and information sciences in US and in Canada. The most recent survey results were published on April 5th 2011 and can be found at http://www.cra.org/resources/taulbee/ Some highlights include:

- Total enrollments rose in 2010 by some nearly 11% over the numbers in 2009
- This is the third straight year of increases in total enrollment
- Degree production in computer science departments was up by 9%
- Share of degrees granted to females rose to 13.8%, an increase of 2.9% over the 2009 figures

The Taulbee Survey is based on activity in Ph.D.-granting institutions in the U.S. and Canada. Declining enrollments remain of concern, and it is highly desirable to gather reliable statistics for the whole community. The annual Taulbee Report is limited in reach; currently there is no similar source of information about the large number of other institutions. The TauRus project aims to address this.

There was a meeting between Renee McCauley (current chair of SIGCSE), Jodi Tims and Andrew McGettrick at SIGCSE in Dallas. Jodi had received initial funding of $5000 from SIGCSE to work on statistics gathering. She has made contact with CRA and they may help with further work. Also she has incorporated in her later work the earlier study by Michael Goldweber whose results appeared in Inroads, vol 2, no 2, June 2011, pages 38-42 in an article: TauRus – A “Taulbee Survey” For the Rest of US.

Over the last year and with help from the Education Board, funding has been obtained from ACM with support from Google to regularize the TauRus work. A new committee - now referred to as ACM-NDC has been formed; NDC = non-doctoral-granting departments in computing. It consists of Stu Sweben (chair), Jodi Tims, John White, Jane Prey, Maggie Johnson and Yan Timanovsky (and it has support from Michael Goldweber). This is pressing ahead with a sustainable effort that will carry out the survey on a regular basis and so resulting in a much broader and more complete perspective on statistics for the community.

It should be noted that Taulbee (which probably gets about 50% completed forms) had only around 17% responses initially but when institutions saw the impact of the early work they were more encouraged to complete and the situation improved. So for ACM-NDC there is an onus on getting (even preliminary) results published and the hope is that this will act as a catalyst for improved responses and even more meaningful results.

1.10 Promoting new curricular themes and strategies

The continuing anxieties about the state of enrollments and poor retention rates in some quarters suggest that there continue to be problems with the image and effectiveness of computing education. It is appropriate to continue to address this head-on and to continue to see it as important.

One of the major challenges is to understand in detail the nature of computing education at all levels and to decide how to re-conceptualize computing education in a way that will make it more appealing.

1.11 Enhancing the effectiveness of the Education Board and Education Council
The Education Council has been in existence now since 2006. Now a process of refreshing the membership of the Education Council has been established and that process of change has become the norm so that the work of the Council is continually refreshed with an injection of new ideas.

During the year and in response to requests from members of the Education Council about better communications mechanisms, steps were taken to provide updates on computing education matters; in particular the Board has now included a column, called “EduBits,” in each edition of Inroads.

At SIGCSE 2012 the Ed Board was approached by the National Science foundation (NSF) and asked to undertake an activity leading to improvements in education in cyber security (in higher education). A submission was made to NSF and funding of this has just been approved (10th September 2012).

1.12 Technology and Tools Task Force

The Technology and Tools Task Force, chaired by Education Board member Dan Garcia, with former Education Council members Sally Fincher and Don Bailes, have as their charter: “Promote great teaching by providing the best technology and tools resources for computing educators.” They developed a Web 2.0 website: Technology that Educators of Computing Hail (TECH). Dan leads a group of (mostly undergraduate) students at UC Berkeley who work on the site, with the help of 36 volunteer moderators (faculty, graduate students and undergraduates from institutions around the world). Two years ago, activity was centered on migrating the site from the Plone-based ACM server to the Drupal-based Ensemble server. The TECH home is http://www.computingportal.org/TECH/.

Ensemble is a project of Education Board member Lillian “Boots” Cassel and several other faculty, and is described on their About page at http://www.computingportal.org/about:

Ensemble is a new NSF NSDL Pathways project working to establish a national, distributed digital library for computing education. Our project is building a distributed portal providing access to a broad range of existing educational resources for computing while preserving the collections and their associated curation processes. We want to encourage contribution, use, reuse, review and evaluation of educational materials at multiple levels of granularity and we seek to support the full range of computing education communities including computer science, computer engineering, software engineering, information science, information systems and information technology as well as other areas often called “computing + X” or “X informatics.”

The Ensemble site provides a wealth of web 2.0 features, such as commenting, rating, and tagging of resources. It also supports roles, which serve as a reward structure for encouraging participation. Finally, Ensemble has a growing user community, which will be key to the success of TECH. The Beta launch of TECH in Ensemble took place at SIGCSE 2011, and Ensemble itself went off Beta at SIGCSE 2012 after a revamp of its interface. The upcoming year will focus on refreshing the tools to add those that have been recently authored, and integrating the Piazza tool to facilitate group discussion around TECH tools.
Section Two

Priorities for FY 2013

2.1 Review of priorities of the Board

During the previous FY much progress was made on a number of fronts. Separate committees have been set up to take forward the earlier work of TauRus and the CS 10k challenge. The Education Board / Council will wish to maintain a lively interest in these developments and will wish to receive reports on progress, but the main focus of activity has moved elsewhere.

The work on CS 2013 is reaching a crucial stage and over the coming year the bulk of activity will shift to producing a final report. A further consultation activity is envisaged and that will be important. But work on identifying exemplars of good practice and making these available to the community will mean that an ongoing activity will be required for some time.

In the light of the interests in online learning and cyber security, it seems desirable that the Education Board should review its main priorities. This needs to be carried out in a sensitive manner so that earlier priorities are not just dismissed but are given due attention and prominence.

2.2 Forthcoming Education Council activities

In the coming FY, there is the opportunity for a single meeting of the Education Council. This is likely to take place around Spring of 2013 but details have not yet been set. There is a need to build on the success of previous Council meetings, maintain the momentum and address identified action items.

2.3 Supporting K-12 efforts

Building on the success of the brochure

The production of the brochure and the linked web site had been a high profile activity of the Education Board / Council that seemed to have had a wholly beneficial impact. Every piece of feedback has been entirely positive and there is still interest in that. Although there are indications from the top institutions that there is a recent alleviation of the enrolment problems, it is far too early to make sweeping claims; the work of ACM-NDC should shed light on the situation. There are regular suggestions of updating the brochure and the associated web site. These are being dealt with as they arise.

AP initiatives

Various members of the Education Council are involved in the ongoing developments of the new AP examination under the leadership of Jan Cuny. To be more specific Owen Astrachan is one of the Co-PI’s of the Commission working on the new AP CS Principles course and both Chris Stephenson and Mark Guzdial are members of the Commission. Jan Cuny, Dan Garcia, Deepak Kumar and Eric Roberts are members of the associated Advisory Group.

Trials of the initial ideas have taken place, the attestation activity has been successfully negotiated, a more extensive set of trials is being completed and there is the ongoing problem of supporting the CS10k project. The Board / Council will retain an interest in ongoing developments and offer support as needed.

2.4 Plans of the Committee for Computing Education in Community Colleges (CCECC)

The CCECC plans to pursue the following activities in FY13 (July 1, 2012 – June 30, 2013):
• Received $25,000 in funding from the ACM Education Board to launch phase 2 of the associate-degree IT project – July 1, 2012.
• Launch phase 2 of the associate-degree Information Technology (IT) project in accordance with phase 1 findings and phase 2 funding. (Phase 1 report provided along with this annual report.)
  o Participated in the U.S. Department of Labor IT competency model initiative
  o Assemble team of subject matter experts based around core pillars
  o Assemble team of assessment experts
  o Conduct in-person kick-off meeting (January 2013) at ACM HQ in NYC
  o Conduct monthly conference calls
  o Produce first draft of associate-degree curricular guidelines for IT
  o Initiate dissemination of guidelines via CAP Space
• Appointment of additional CCECC associate members in support of the associate-degree IT project.
• Ongoing development and maintenance of CAP Space, an online repository of curricula, assessment and pedagogy resources – www.capspace.org.
• Continue participating in the CS2013 steering committee curricular development project.
• Continuation of our representation on and collaboration with the ACM Education Policy Committee.
• Continuation of our representation on and collaboration with the ACM-W council.
• Continue serving on the ACM Inroads task force to chart future direction for magazine.
• Begin serving as a Security Ambassador under NSF award #1241738 through the Federal Cyber Service, Scholarship for Service (SFS) program - “Security Injections: Promoting Responsible Coding and Building a Community of Security Ambassadors.” ACM headquarters received funding as a sub award under this NSF grant (9/1/2012 – 8/31/2015).
• Engagement in a variety of advocacy efforts on behalf of computing education in the community college sector including Grace Hopper conference 2012 and CSEdWeek 2012.
• Continue collaborating with Chris Stephenson, Executive Director of CSTA – www.csta.org
• Continuation of dissemination and outreach activities, including mailings, website enhancements, conference sessions and exchanges with colleagues, as well as continuation of our SIGCSE Inroads column and participating with the ACM Education Council.
• Continuation of support for the ACM Education Council and Education Board goals and objectives

2.5 Undergraduate curriculum efforts

Towards computer science 2013

The CS 2013 effort will be entering its final phase of the coming year with the consolidated report due to be published in next summer. In the meantime further presentations will be given at conferences, a final consultation effort will take place and arrangements will be made to make high quality exemplars available to the community.

Two-Year College IT plans

The work outlined in section 1.6.3 will proceed, with Phase II commencing. The Education Board will be involved in monitoring progress and in supporting that work.

Software engineering and computer engineering

Work on carrying out reviews of both the Software Engineering volume and the Computer Engineering
volumes will proceed. The various committees have been established and their work is in progress.

**Information Technology**

SIGITE has come forward to the Board with a request to initiate a review of their Information Technology guidance, published originally in 2008. The opportunity will be taken to pull these processes into line with the other processes of the Board. A preliminary study is being requested prior to the main study so that the parameters are clear to everyone.

This request has given prominence to a matter that has been in the Board’s thinking for some time: should there continue to be separate Information Systems and Information Technology reports or should these be merged? This will be addressed in the coming year.

### 2.6 Masters guidance on Information Systems

It is anticipated that in the coming months the Board will receive a request to initiate a review of Masters level guidance on Information Systems. The last report appeared in 2006 and a review seems appropriate.

### 2.7 Extending the leadership role

The Education Board needs to continue to be alert to enhancing its leadership role. Beyond the activities already identified, the Education Board will need to consider the possibility of additional curricular developments. The nature and scope of the CS 2013 report will be crucial in this regard, and any conclusions emerging from that work.

### 2.8 International activities

During the next FY existing international activities will be maintained but in addition some new initiatives will take place. In terms of ongoing activity:

- The Education Board will need to continue to work to support ACM India in making progress with their educational initiatives
- It is expected that there will be a resolution of the discussions concerning the intended relaunch of the Informatics Education Europe series of conferences. It is worth noting that there have been expressions of real interest from several quarters and it is clear that there is a computing education community in Europe whose needs have to be addressed. Any new series of computing education conferences has to be put on a sound footing.
- In Europe there is now a permanent accreditation activity based on the results of the Euro-Inf project, namely EQANIE. Members of the Board / Council continue to monitor developments.
- Developments associated with the Seoul Accord (with Joe Turner of the Education Council as chair) continue to be monitored.

With these various developments it seems appropriate for the Education Board to take a more strategic view of how it should support computing education globally. Very recently a representative from ACM India has been included in the membership of the Education Council. The notion of partnering with and supporting the various ACM councils seems highly relevant.

### 2.9 PACE – moving forward

The concept of PACE has now emerged and has been agreed to. PACE has to be seen as serving a useful purpose beyond being just a venue for the various actors to learn to know about each other’s work. It should lead to immediate coordinated action and begin to have an impact. It is anticipated that this will happen over the coming months.

### 2.10 Promoting new curricular themes and strategies

Addressing the matter of new curricular themes and strategies is central to many of the Education Board / Council activities. Some of the new activity within the Council has this as a central focus and concern. The conclusions of the CS 2013 project will provide an opportunity for reflection here.
2.10.1 Online learning

The Education Board intends to approach the SIG Governing Board about moving forward with a high profile symposium on online learning. Early thinking suggests that:

- The Symposium (lasting around two days, perhaps) should involve around 80 – 100 interested parties and should take place relatively soon in the US
- The participants should be those who are at the forefront of current developments in online learning, and they should be asked to provide position papers on their perspectives
- The proceedings should be published by ACM
- There is much happening and it would be desirable to establish ACM’s position as a supporter of these efforts
- An outcome of the Symposium should be a clearer picture of how online learning might be embedded in the ongoing activities of ACM
- Online learning has the potential to underpin many of ACM’s activities in support of its members and it would be important for ACM to establish a position on this

2.10.2 Cyber security education

As already reported the Education board has received a grant from NSF – the study is entitled Towards Curricular Guidelines for Cyber Security. This will involve holding a meeting of experts in the area and producing a report with recommendations that will include:

- An informed statement from experts about the nature of college and university level education needed to support the development of a skilled work force in cyber security
- Recommendations from these leading experts about desirable developments in cyber security education including importantly the issue of uptake at college and masters level
- Comments on the extent to which existing provision might (with suitable minor tweaking) address the need
- Comments on the extent to which new completely new courses, both at undergraduate level and at masters level might be desirable.

These matters have to be made available to the wider cyber security and computing communities, to ACM in the first instance and to other societies through the mechanisms of PACE, through publications and through airing the conclusions at conferences.

2.11 Continuing to foster a positive image of computing

The Education Board / Council continue to believe that fostering a positive image of the discipline must remain a central concern. The vision must be appealing and stimulating to the community, it needs to offer advantages over existing possibilities, and it must lead to a measurable benefits in terms of enrollment trends. The Education Board / Council must continue to take the lead in this activity, but it will be important to engage the broader community in this discussion and debate.

It remains important to identify new curricular models and approaches that have proven to be effective in the institutions at which they were developed and then helping to promote the distribution of those new models by developing new curricular recommendations around those themes. The overall success of this endeavor will almost certainly require experimentation with many models, not all of which will succeed individually. The goal is to promote a diversity of strategies and then to let individual institutions choose models that are likely to work well in that environment.

2.12 Increasing visibility within the community

Another strategic goal toward increasing the effectiveness of the Education Board / Council consists of
promoting public awareness of our work. Increasing our visibility is important:

- The community needs to be informed about the changes that have occurred and the reasons underlying those changes. It is encouraging that members of the Practitioners Board recently sought an update on Education Board/Council activities at a meeting in mid-June 2011 in San Francisco. That has been viewed very positively and may lead to a closer working relationship between the Boards.

- At a time in which so many people in computing education continue to feel threatened by the possibility of declining enrollments, it is important for the ACM to be seen as an organization that not only cares about the problems but also as one that can marshal the resources necessary to have an impact. By showing support for the community, the ACM will be in a better position to enlist their aid as needed.

- The Education Board/Council need to firmly establish their leadership position and a fundamental aspect of this is being visible and being seen to be active in addressing the problems of the day and providing the necessary support.

These matters can now be addressed more effectively in various ways. There have been presentations at conferences, publication of curricular guidance, etc. But we must continue to address these matters in ways that ensure sustainability.

Acknowledgements

This report has relied heavily on the work of many people – those engaged in CS 2013, the CCECC group, Yan Timanovsky and members of the Education Board and Education Council.
Annex A

Roster of the Education Board and Education Council members (FY 2011)

**Education Board**
- Andrew McGettrick, Strathclyde University (Chair)
- Lillian Cassel, Villanova University
- Dan Garcia, University of California at Berkeley
- Mark Guzdial, Georgia Tech
- John Impagliazzo, Hofstra University
- Maggie Johnson, Google
- Jane Prey, NSF and formerly of Microsoft
- Eric Roberts, Stanford University (past chair)
- Mehran Sahami, Stanford University
- Larry Snyder, University of Washington
- Heikki Topi, Bentley University
- Yan Timanovsky, ACM Education Manager
- John R. White, ACM Chief Executive Officer
- Chris Stephenson, Executive Director, Computer Science Teachers Association
- Cameron Wilson, Computing Education Policy Committee (and ACM)

**Education Council** (which also includes the members of the Education Board)
- Flo Appel, Xavier University
- Owen Astrachan, Duke University
- Marc Barr, Middle Tennessee State University (SIGGRAPH)
- Barbara Boucher Owens, Southwestern University (SIGCSE)
- Jan Cuny, University of Oregon/NSF
- Peter Denning, Naval Postgraduate School
- Joseph Ekstrom, Brigham Young University (SIGITE)
- Dan Grossman, University of Washington (SIGPLAN)
- Beth Hawthorne, Union County College (CCECC)
- Mathai Joseph, representing ACM India
- Lisa Kaczmarszyk, University of California at San Diego
- Deepak Kumar, Bryn Mawr College
- Rich LeBlanc, University of Seattle
- Terry Linkletter, Central Washington University
- Robert McCartney, University of Connecticut (ToCE)
- Ken Martin, University of North Florida, ABET
- Mirella Moro, Universidade Federal de Minas Gerais – UFMG, Belo Horizonte - MG, Brazil
- Peter Norvig, Google
- Barbara Price, Georgia Southern University, ABET
- Eugene Spafford, Purdue University
- Carol Spradling, Northwest Missouri State University
- Mark Stehlik, Carnegie Mellon University
- Josh Tenenberg, University of Washington (ToCE)
- Joe Turner, Clemson University (retired)
- Gerrit van der Veer, Vrije Universiteit Amsterdam, the Netherlands (SIGCHI)
- Patrick Walsh, IBM, ABET
- Michael Wrinn, Intel
- Alison Clear / Young, Auckland University of Technology, New Zealand
Annex B
ACM Committee for Computing Education in Community Colleges (CCECC)

Information Technology Curricular Guidance Project
Concluding Report of the Investigative Phase to the ACM Education Board

January 19, 2012
Submitted by Elizabeth K. Hawthorne, Chair ACM CCECC

I. Charge
The CCECC was charged by the Education Board with determining whether formal ACM associate-degree level curricular guidance in the area of Information Technology is needed. To this end, the CCECC assembled a diverse working group of two-year college, four-year college and industry participants to discuss the nature of associate-degree IT programs, to identify challenges and opportunities associated with curricular guidelines in this field, and – if appropriate – to outline the basic premises for such guidance.

II. Working Group
The working group consisted of the following individuals:

• Deborah Boisvert, BATEC executive director, University of Massachusetts, Boston, SIGITE member
• Rob Deadman, Ivy Tech Community College System, SIGITE member
• John Impagliazzo, Emeritus, Hofstra University, ACM Education Board Observer
• Margaret Leary, CyberWatch leadership team, Northern Virginia Community College
• Dan Myers, academic coordinator, Citrix Systems, industry representative
• Sierra Hampton, certification and hiring, Citrix Systems, industry representative
• Lance Perez, University of Nebraska, IEEE representative
• Michael Qaissaunee, Brookdale Community College
• Anita Verno, Bergen County College, CSTA Advisory Board, SIGITE member
• Christopher Wu, City College of San Francisco, MPICT associate director
• Kim Yohannan, Academic Alliance Manager at EMC, industry representative

III. Detailed Report of Findings
The working group used online discussion forums, a structured in-person meeting and a series of focused conference calls to pursue its deliberations; a compilation of their working notes accompanies this report. The conclusions of the working group are significantly incorporated into the CCECC’s report of findings, which follows below.

• There is a compelling need for ACM to produce IT curricular guidance for associate-degree level programs. However, the typical model for such guidelines built on a comprehensive body of knowledge comprised of knowledge areas made up of knowledge units in turn comprised of topics, is not well suited to the dynamic and encompassing field of IT.

• ACM IT curricular guidance should be formulated using a new model, one better suited to the varied and vibrant universe of associate-degree IT programs, one which accommodates rapidly changing IT developments and emerging technologies, and one which reflects an awareness of the existing baccalaureate IT body of knowledge. Without a doubt, such a model must be built from the ground up on a framework of learning outcomes.

• While one can debate the designation of any number of associate-degree programs as “IT” or not, there is no doubt that many programs now share a collection of core IT skillsets (including “traditional” titles such as network administration, desktop support and web development, as well as more contemporarily-emerging titles such as computer forensics, game design, health information management, geographic information systems and cloud computing). ACM IT curricular guidance should reflect this reality, and should be constituted by a collection of learning outcomes that define core IT competencies. These learning outcomes should be assembled into a framework of defined pillars or competency domains, a framework informed by resources such as the IT Competency Model (www.careeronestop.org/COMPETENCYMODEL/pyramid.aspx) and other materials from
The learning outcomes defining core IT skillsets must not be overly technology specific or prescriptive and must be crafted in a manner that ensures they have reasonable staying power in this era of extraordinarily rapid change. The core IT learning outcomes must be adaptable and must accommodate significant diversity, for programs tailored specifically to local employment opportunities, students pursuing transfer opportunities to baccalaureate IT programs, curricula integrally influenced by industry certifications, interdisciplinary or blended programs, capstone and internship opportunities, and similar scenarios.

More so than perhaps in any other computing field, business and industry considerations play a critical role in constituting core IT learning outcomes. ACM associate-degree IT curricular guidance must be influenced by the current and future needs of business and industry, by certifications and related curricula, by government and standards bodies, and by new and emerging technology. So-called “soft skills” must also be integrated into such curricular guidance.

Today’s world is influenced significantly by the fact that IT spans borders and continents, cultures and languages, time zones and geographies, governments and industries. Business worldwide is built on technology resources and capabilities, workers around the globe must acquire core IT competencies, and educational institutions in every nation are called on to provide an IT-enabled workforce. ACM IT curricular guidance should be international in scope and application.

Core IT learning outcomes must be accompanied by well-designed assessment rubrics and meaningful evaluation metrics to gain credibility and broad acceptance by both the two-year and four-year college communities as well as the business and industry community.

The undertaking called for herein must be pursued by a comprehensive team of individuals, not only representing various educational and industrial sectors, domestic and international settings and the breadth of IT-related curricula, but also consisting of both subject matter content experts as well as experts in measurement and assessment.

Matters of pedagogy are best addressed by fostering a broad and active community of IT educators, facilitating communications among the group and promoting the sharing of instructional techniques, strategies and resources. Such efforts are worthy pursuits as adjunct activities to the work envisioned by these recommendations.

IV. Summary
The CCECC makes a formal recommendation to the ACM Education Board that:

- An associate-degree IT curricular task force be constituted and funded, under the direction of the CCECC, to produce IT guidance which is:
  - Built from the ground up on a framework of learning outcomes.
  - Constituted by core IT competencies assembled into a framework of defined competency domains.
  - Influenced by the current needs and future trends of business and industry, by certifications and related curricula, by government and standards bodies, and by new and emerging technology.
  - Designed in a manner that provides for staying power, breadth and adaptability.
  - International in scope and application.
  - Accompanied by well-designed assessment rubrics and meaningful evaluation metrics.
- Upon acceptance of this report by the Education Board, with the concomitant endorsement of the foundational constructs discussed herein, the CCECC will be pleased to provide a detailed project plan with a proposed timeline and estimated budget.

V. Supplemental Materials with Embedded References
- The outcomes from initial project meeting (previously reported to Ed Board and Council) are attached.
- Deliberations, follow-up conclusions, and embedded references taken from a series of conference calls are attached.
- Login access to the associated online discussion forums at www.capspace.org is available upon request.