**ACM Education Board**

**Annual Report for FY 16**

*October 2016*

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**Executive Summary**

This report summarizes the activities of the ACM Education Board and the Education Council in FY 2015 and outlines priorities for the coming year. Major accomplishments for this past year include the following:

* Curricular Volumes
* Computer Engineering 2016 (CE2016)
* Information Technology 2017 (IT2017)
* Enterprise Information Technology Boy of Knowledge (EITBOK)
* Masters of Science in Information Science 2016 (MSIS2016)
* New Curricular Efforts
* Cybersecurity
* CC2005 Update (CC2020)
* Data Science
* India Initiatives
* 2016 Learning at Scale conference
* Taskforce on diversity
* Taskforce Building Teaching Capacity in CS
* NDC Study
* Education Board membership and rotation definition
* First Implementation of Education Council membership rotation

Details:

* A formal process for membership of the Education Board was defined and implemented.
* Continue to enhance the effectiveness of the Education Board and the Education Council including review of the selection and rotation of members of the Education Board. Implement any modifications as needed to the membership and rotation process.
* Increase engagement with the Committee for Computing Education in Community Colleges (CCECC), particularly with respect to curricular opportunities.
* Given the large number of curricular activities now underway, continue support and oversight for all efforts.
* Held an Education Council meeting San Francisco in August 2016
* Broaden international participation in computing education activities; in particular increasing the information flow and engagement opportunities by appointing additional international members to the Education Board.
* Continue to support discussions between SIGCSE and Informatics Europe about initiating a new high-profile annual computing education conference in Europe
* Increase the visibility of the Education Board and the Education Council within the community
* Move forward in terms of renewing the leadership of the Ed Board. The existing Education Board had been very active and had invested considerable time and energy in various successful initiatives; it seemed appropriate to look forward to new leadership and to refreshing the membership of the Education Board.
* Creation of a Vice-Chair position on the Education Board to help manage the many activities underway.

Challenges for FY 2017 include continued development of many of last year’s activities:

* Identify new strategic areas and review current priorities to guide the leadership of the Ed Board and Ed Council.
* Continue to evolve arrangements associated with the development of both the Education Board and the Education Council, including how to enhance the relationship between the Education Council and its SIG representatives. Ask the question of why we invite these representatives to be part of our Council. What is our value to their organizations and what is their value to us?
* Continue the established Education Council priorities and working groups for FY2016 activities with the following topics targeted:
  + Diversity
  + International
  + Cybersecurity
  + Curriculum
  + Capacity building

These activities include:

* Continue to support the development of various curricular volumes with special emphasis on how they would be useful internationally.
* Continue to support K-12 activity with the addition of a Code.org member to the Education Council.
* Continue support for the Learning at Scale 2017 conference to be held at MIT, Cambridge, MA in April, 2017.
* Increase international activity, and in particular monitor developments with ACM India and ACM China and support any new computing education conference in Europe (as well as any related activity)
* Support the CCECC and in particular its IT initiative
* Support the interim review of Computer Engineering curricular volume in conjunction with the Computer Society
* Undertake a review of the Information Technology guidelines in conjunction with SIGITE; examining the wisdom of having separate IT and IS volumes – this will need to involve the Education Board, AIS and SIGITE
* Pursue a Master’s-level review of guidance on Information Systems (MSIS)
* Continue to support and further develop ACM-NDC and potential collaboration and overlap with the CRA Taulbee Report. Begin longitudinal examination of the now 5-years’ worth of data.
* Continue to extend the leadership role of the Education Board and the Education Council
* Move forward with the a curricular volume on Cybersecurity at the undergraduate level
* Lead the development of a curricular volume on Data Science at the undergraduate level.
* Lead a Taskforce on Diversity (a sub-group of the Education Council) to ensure current knowledge by all Board and Council members.
* Assist the Taskforce on Building Teaching Capacity in CS (a sub-group of the Education Council).

**Section One**

**Summary of FY 2016 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 context for its activities. 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**

Over time, the Education Board and council have identified a set of strategic objectives that remain a focus for their continued work:

* To provide a focus for ACM activity and leadership in the general area of computing education
* To support the 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 a meeting of the Education Board January, 2014 in San Francisco, the following priority areas had been identified, namely supporting

* International Outreach
* Diversity
* Curricular guidelines
* Computing Terminology
* K-12 Computing

These priorities were continued for the FY2015. The priorities for FY2016 include all of the above with the addition of data science and cybersecurity to the curricular priority areas and the exploration of updating CC2005 into CC2020.

**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 (SIGCAS, SIGCHI, SIGCSE, SIGITE, SIGGRAPH, SIGPLAN)
* There are representatives of CSTA, the CCECC, the Education Policy Committee and Code.org
* Representatives from ACM India and ACM China
* Industry representatives
* Certain ABET/CSAB and accreditation 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 (e.g., SIGHPC)

In making decisions about the phrase “significant educational activity,” activity such as an education strand or theme within an annual conference qualify, or the existence of an education officer. The updated membership of the Education Council is included in Annex A. A review of the current Sig and other organization membership was completed. The interests and influence in education as it relates to ACM by the Education Council and by the organization will be the criteria for continuation on the Education Council.

The new Education Council rotation process has completed its first year. Members rotating off were recognized for their contributions during the August 2016 Education Council meeting with new members and advisors in place.

Rotation of the membership of the Education Board was defined and implemented.

Currently, the Education Board is made up of 10 members plus the 3 ex-officio members (representing the ACM HQ, Public Policy Office and CSTA).

After discussion with the Education Board, the following guidelines were established for membership rotation for the ACM Education Board.

Beginning in 2016-2017 term, the Education Board will be comprised of a similar number of members.

Rotation for Members:

1. Board terms of 2-years with up to 2 possible re-appointments.
2. 1/2 of the members will be eligible for rotation off or re-appointment each year.
3. The process will start with the Education Board of 2016- 2017.
4. The [co-]chair[s] of the Education Board are appointed [and re-appointed] by the ACM President.

Other Rotations:

1. With the appointment of [a] new Education Board [co-]chair[s], the current [co-]chair[s] will move to the Education Board as Past Education Board [co-]chair[s] and will serve until the new chair becomes the former chair.

**1.2.2 Education Council meetings**

It was decided that for practical and budgetary reasons, the Education Council would meet face to face once a year. The FY2016 meeting was held in San Francisco August 22-23, 2016.

This meeting of the Education Council included both the new members to the council as well as those whose term had come to an end. The retiring members were recognized with a certificate of appreciation and personalized crystal pyramids thanking them for their service.

**Themes**

In planning the meeting, the following goals were identified, namely to:

* Welcome new members to their first meeting of the Education Council and to provide them with information about the ongoing activities, and recent initiatives
* Provide an overview of the new term appointment and rotation structure for Ed Board membership
* Receive an update on the priority matters, namely: new and on-going curricular initiatives (IT, CE, CyberSecurity, Data Science, Overview Volume), the Learning at Scale conference (outcomes from 2016 and plans for 2017), developments on AP CS Principles, updates on ACM-NDC, CSTA, K-12 CS Framework, Diversity taskforce, Capacity planning taskforce, and hear about happenings from ACM international bodies (Europe, China, India) related to education.
* Brainstorm to identify new and rethink existing education-related opportunities for ACM
* To plan future work activity toward specific deliverables

Presentations and discussions occurred around the following topics:

K-12 CS Framework

Data Science curricula effort

AP CS Principles

ACM Europe

ACM China

ACM India (including update on India national programming aptitude exam)

Discussion led by Diversity Taskforce

Revision to CC2005 Overview Volume

CE2016, IT2017 and EITBOK updates

CyberSecurity curricula effort

MSIS 2016

CSTA

ACM Policy

ACM-NDC Study (survey)

CRA enrollments/capacity planning group

Capacity Planning group

CS10K and CSForAll

Task force to update ACM’s Code of Ethics

Brazil Computing Society

CCECC

ACM-W

CSAB/ABET

SIGCAS

SIGCHI

SIGGRAPH

SIGHPC

SIGCSE

SIGITE

SIGPLAN

The next Education Council meeting will be at SIGCSE in March 2017. The next face to face Council meeting will be late summer, 2017.

**1.3 PACE – Partnership for Advancing Computing Education**

PACE (Partnership for Advancement of Computing Education) consists of academic and professional societies with an interest in advancing computing education. Current formal members include ACM, AIS, CRA-E, and NCWIT. In addition, AITP SIGED, CSTA, and IEEE-CS have participated in recent activities. In fall 2015, the organization’s leadership dedicated its efforts to finalize the report from the August 2014 workshop on Computing Education Research. This document was completed and accepted in December 2015. In early 2016, ACM Education Board accepted the proposal to invite representatives of PACE member organizations to the August 2016 ACM Education Council meeting as guests with their own travel funding. There was also a dedicated follow-up PACE meeting.

The August 2016 meeting was an excellent opportunity to get the PACE process restarted.  Representatives from ACM, AIS, AITP EDSIG, CSTA, IEEE-CS, and NCWIT met for four hours after the ACM Education Council meeting to discuss the future of PACE; all participants of this meeting also had an opportunity to participate in the preceding ACM Education Council meeting. The conversation was a very useful exchange of information regarding the current activities and priorities of the participating organizations. The meeting offered also an opportunity for a direct and frank discussion regarding the future of PACE. It concluded that the best opportunity for PACE to survive and provide value for its member organizations is to organize an annual or biennial workshop focusing on a topic that is of interest to a significant percentage of computing societies (chosen by the educational leadership of the members). For the process to become sustainable, each workshop should ultimately lead to a publication, such as an edited volume of papers by organizational representatives and other experts. PACE meeting participants will develop this idea further and explore the feasibility of its implementation.  If ACM agrees, PACE members would like to meet again in the context of the 2017 Education Council meeting. PACE process participants are very grateful for ACM’s continued support!

**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, and has undergone various phases of 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. Since we expect the AP CS Principles curriculum to be an important project for the Education Council, Owen was appointed to an Advisor role since his term on the Education Council has completed. Dan Garcia, longtime Ed Board and Council member, has also been appointed an Advisor on this project.

* + 1. **CSTA**

CSTA continues to develop its new initiatives. 2015-2016 work included:

* Participation in CS Ed Week in December
* Faces of Computing video competition, which promotes diversity. The competition theme this year is “computing for the social good.”
* Annual CSTA conference – next July in San Diego. At the request of members, we will be expanding the days of education in 2016.
* Participation as presenters at various events, such as the 1st National K-12 Cybersecurity Conference, and the World Computer Congress in Daejeon, Korea.

New initiatives include:

* The Cutler-Bell Award (Jane Prey is representing the Education Board/Council on the steering committee)
* Partnerships with the Congressional App Challenge, the NSA for their Day of Cyber, and Code.org.
* Revise the CSTA K-12 Computer Science Education Standards with projected new version in Fall 2016.
  + 1. **Framework for K-12 CS Education**

Code.org has been invited to join the Education Council. In January 2016, the ACM (represented by Mehran Sahami) joined the CSTA, Code.org, Cyber Innovation Center, and National Math and Science Initiative on the steering committee for the framework. The committee is joined by more than 100 members of the computing community (higher ed faculty, researchers, and K-12 teachers), several states and large school districts, technology companies, and other organizations to develop the conceptual guidelines for states and districts creating a K-12 pathway in computer science. Code.org, NMSI, and the ACM are providing funding for this effort. The final version of the Framework will be released in October 2016.

* + 1. **Additional considerations**

The AP CS Principles (CSP) course will be taught “officially” in Fall 2016 with the first AP CSP Exam in May 2017. The AP CSP is designed as a different course and compliments AP CS A.

Approximately 1,000+ teachers will teach a CS Principles course in 2015-2016. The College Board and NSF are sponsoring ~50 teachers in a pilot project with more teachers piloting for other projects.

* 1. **Report from the Committee for Computing Education in Community Colleges (CCECC)**

Dr. Elizabeth K. Hawthorne, outgoing CCECC Chair and Dr. Cara Tang, incoming CCECC chair provide the following annual report on the milestones and activities of the ACM Committee for Computing Education in Community Colleges (CCECC). Previous annual reports of the CCECC are archived online at http://ccecc.acm.org/about/reports.

In 2015, the ACM CCECC celebrated 40 years of service to computing education, its ruby anniversary. The ACM CCECC serves and supports community and technical college educators in all aspects of computing education.

CCECC PURPOSE: http://ccecc.acm.org/about. The ACM Committee for Computing Education in Community Colleges (CCECC) is a standing committee of the ACM Education Board concerned with computing education at associate-degree granting colleges in the United States and similar post-secondary institutions throughout the world. The Committee engages in curriculum and assessment development, community building, as well as advises on public policy and advocacy in service to this sector of higher education.

CCECC MEMBERSHIP beginning July 1, 2016: Members

• Cara Tang, PhD, CCECC Chair; Faculty and Co-Department Chair, Portland Community College, OR

• Cindy Tucker, CCECC Vice-Chair; Professor, Bluegrass Community and Technical College, KY

• Elizabeth K. Hawthorne, PhD, CCECC Immediate Past Chair; ACM Distinguished Educator, Senior Professor, Union County College, NJ

• Teresa Moore, CCECC member; Associate Professor, Volunteer State Community College, TN

• Christian Servin, PhD CCECC member; Computer Science Faculty, El Paso Community College, TX Emeriti Members

• Mr. Robert Campbell (former chair)

• Dr. Karl Klee (former chair)

• Dr. John Impagliazzo (founder)

• Dr. Joyce Currie Little (founder)

• Dr. Dick Austing (founder)

The CCECC achieved the following milestones in FY16 (July 1, 2015 – June 30, 2016):

* Made significant progress on revising the 2009 Associate-degree Curricular Guidance in Computer Science (ccecc.acm.org/guidance/computer-science) with contemporary cybersecurity learning outcomes, dubbed CS-Cyber. CS-Cyber is based on the ACM CS2013 guidelines, the cyber education project learning outcomes, the National CyberWatch Center’s mapping to the NICE framework, and the DHS/NSA’s KUs for CAE/2Y designation in cybersecurity.
  + Both a special session and a workshop were held at SIGCSE 2016 to engage the community in developing the CS-Cyber associate-degree curricular guidelines.
* Completed StrawDog draft version of CS-Cyber for public review and comment - ccecc.acm.org/ACMCompSciStrawDog
* Recruited 2 new Committee members (joined July 1, 2016)
  + Teresa Moore, Volunteer State Community College, TN
  + Christian Servin, PhD, El Paso Community College, TX
* At SIGCSE 2016, the CCECC celebrated 40++ years of ACM’s commitment to computing education in community colleges. For the celebration, we created coordinated marketing materials that included a new Committee logo, brochure, booth banners, table skirt, and business cards. We also held an evening dessert reception with a drawing for cool tech prizes that was sponsored by Intel Education. July 7, 2016.
* Completed comprehensive redesign of the Committee’s website: user interface, backend database, and URL address.
  + capspace.org is now ccecc.acm.org
* Completed migration of CCECC website from Microsoft hosting platform to ACM’s cloud hosting environment.
* Completed migration from the Committee’s collaborative work environment, Microsoft Office 365 Sharepoint for Small Businesses to Google Apps for Non-Profits offered through ACM’s IS Department.
  + New email addresses were established for each Committee member.
* Maintained the new website http://ccecc.acm.org/
* Maintained CCECC educator database with over 6,000 confirmed email contacts of two-year college computing educators
  + Started using Mail Chimp email service to send messages to educators for improved response rate and database maintenance
* Continued serving on the ACM Education Council and Education Board - www.acm.org/education/education-council-and-education-board
* Continued serving on the ACM Education Policy Committee – acm.org/publicpolicy/education-policy-committee
* Continued serving on the ACM-W Council – women.acm.org
  + Provided community college contact information in support of several ACM-W Women in Computing Celebrations
  + Attended annual planning meeting in June 2016
  + Shared booth space at SIGCSE 2016
* Continued collaborating with CSTA – csta.acm.org
  + Recommended community college representative to CSTA Standards revision committee
  + Shared booth space at SIGCSE 2016
* Continued serving on the Joint Task Force for Information Technology to develop undergraduate curricular guidelines – http://it2017.acm.org
* Invited to serve on the ACM Joint Task Force for Cybersecurity Education to develop undergraduate curricular guidelines - http://www.csec2017.org/
* Engaged in a variety of advocacy and outreach efforts on behalf of computing education in the community college sector, including the following conferences: Community College Cybersecurity Summit (3CS) 2015 (July), CSTA Annual Conference 2015 (July), ITiCSE 2015 (July), SIGITE 2015 (October), National Initiative for Cybersecurity Education (NICE) 2015 conference (November), SIGCSE 2016 (March), Women in Cybersecurity conference 2016 (April), NCWIT Summit (May), and Colloquium for Information Systems Security Education (CISSE) 2016 (June). July 7, 2016.
* Ongoing communications with colleagues via the featured, quarterly Community College Corner column in ACM Inroads– columns available in the ACM Digital Library as well as from http://ccecc.acm.org/literature/publications.
* Ongoing community-building, dissemination and outreach activities, including periodic mailings and email messages to contacts in the CCECC educator database, website enhancements, articles, conference sessions, and exchanges and collaborations with colleagues.
* Ongoing support for the ACM Education Council and Education Board goals and objectives.
  1. **Updating the computing curricula guidelines**

With the ever changing computing landscape, it is imperative that our curricular volumes be up-to-date and include emerging areas. We are currently focused on 7 efforts:

Computer Engineering 2016 (CE2016)

Information Technology 2017 (IT2017)

Enterprise Information Technology Body of Knowledge (EITBOK)

Masters of Science in Information Systems 2016 (MSIS2016)

Cybersecurity

Update to Computing Curricula 2005 (CC2020)

Data Science

* + 1. **General strategy**

Discussions from the Education Council and the interest of specific Education Council Board members has led to each of these curricular efforts. We are very fortunate to have such dedicated and passionate members.

* + 1. **Information Technology 2017 (IT2017)**

The ACM Education Board charged a twelve-member international Task Group in August 2014 to update the IT2008 curriculum guidelines and prepare and publish a new report by 2017. The curriculum report, called IT2017, seeks to produce a visionary curricular framework for IT academic programs that will prepare graduates for new computing challenges of a global economy.

The Task Group represents five countries: Canada, China, Saudi Arabia, The Netherlands, and U.S., and many international societies, including ACM, IEEE-CS, AITP, SIGITE, and ISACA. Three members of the task group (25%) are from industry and the majority (58%) are women.

Mihaela Sabin chairs the task group and John Impagliazzo is its liaison to the ACM Education Board. The task group launched a first draft (version 0.51) for public review and comment on January 15, 2016 . The vetting period closed on February 29. The task group examined over three hundreds of comments that guided the revision process and preparation of the second draft (version 0.61). The second public vetting process opened August 15 and is scheduled to close September 15.

Report Highlights:

1. Organizing principle of the IT2017 report are competencies, not knowledge areas
   1. Competency-based approach - what students should be able to do with what they learn , as opposed to a knowledge-based approach - what the curriculum content consists of
   2. Learning experiences designed around real-life, work-related situations and aspects of work that IT professionals and researchers are involved with.
2. Competencies expected by the IT profession and further advanced studies
   1. Understanding (making meaning) and transfer of learning (Wiggins & McTighe 2005, Understanding by Design)
   2. Significant learning (Fink 2003) through synergistic learning activities that combine foundational knowledge and integration and application of learning with personal and social implications, learner’s values and beliefs, and self-knowledge
   3. Assessed through performance tasks that students are expected to demonstrate across the IT degree program’s curriculum (Perkins 1993, Blythe 1998, performance perspective of understanding)
3. IT Curricular Framework is a three-dimensional structure, from general to specific and operationable, starting with broad, high-level organization into IT domains of competencies and becoming specific in the form of performance goals and tasks that operationalize domain-specific competencies:
   1. IT competency domains structure core aspects of IT
   2. Each domain is further defined by a cluster of domain-specific competencies
   3. Each domain-specific competency is operationalized by performance goals and tasks

A variety of surveys were conducted.

* International Survey, Spring 2015:
  + Faculty survey: 16,000 computing faculty (5,500 US, 10,500 non-US), 16-question survey
    - 597 responses (3.8% response rate)
  + Industry survey: 1,871 members of the Association for Information Technology Professionals (AITP), 7-question survey, with 6 matching faculty survey items:
    - 91 responses (5% response rate)
  + Data analysis dissemination: ITiCSE 2015 WG, SITE 2016, and CCSC-NE 2016
* Latin America Survey, Spring 2016:
  + Faculty survey and Employer survey with 7 matching questions distributed to many academic departments and professional organizations in Chile, Colombia, Costa Rica, and Peru.
    - 182 respondents, faculty survey
    - 177 respondents, employer survey
    - Data analysis dissemination plan: ITiCSE 2016 WG
    1. **Cybersecurity Volume**

The Joint Task Force on Cybersecurity Education (JTF) was chartered by the ACM Education Board in September 2015 with the expressed purpose of developing comprehensive, undergraduate curricular guidance in cybersecurity education to support future program development and associated educational efforts. The JTF is a collaboration among major international computing societies: Association for Computing Machinery (ACM), IEEE Computer Society (IEEE-CS), Association for Information Systems Special Interest Group on Security (AIS SIGSEC), and the International Federation for Information Processing Technical Committee on Information Security Education (IFIP WG 11.8). The JTF grew out of the foundational efforts of the Cyber Education Project (CEP) with its members continuing to collaborate with the JTF. Since the fall of 2015, the JTF has been quite busy, and this column provides an update on both its progress and future plans.

The task force members’ first order of business was to agree upon a working definition of cybersecurity. Getting a jump start from the CEP, the JTF defines *cybersecurity* as a “computing-based discipline involving technology, people, information, and processes to enable assured operations. It involves the creation, operation, analysis, and testing of secure computer systems. It is an interdisciplinary course of study, including aspects of law, policy, human factors, ethics, and risk management in the **context of adversaries**.”

Over the last 18 months, the JTF has been busy engaging industry, academia, and government communities in its ongoing work. A complete list of previous and upcoming community engagement activities is available on the JTF website (cs2017.org), including the 2015 NICE conference, 2015 Pre-ICIS Workshop on Security & Privacy (WISP), 2016 National Science Foundation Cyber Corps PI Meeting, 2016 ACM SIGCSE conference, 2016 Women in Cybersecurity conference (WiCyS), 2016 National Cyber Summit, 2016 Americas Conference on Information Systems (AMCIS), 2016 Community College Cybersecurity Summit (3CS), and the 2016 International Security Education Workshop (ISEW).

At the annual ISEW sponsored by Intel Education, the JTF held a two-day, intense community engagement event with over 70 cybersecurity educators and practitioners from across the globe, including Australia and South Africa. The ISEW was co-located with the 20th anniversary of the Colloquium for Information Systems Security Education (CISSE) in Philadelphia, PA. The ISEW was organized around a combination of interactive panel discussions and group breakout sessions.

The panel sessions were designed to seed thought and discussion for the breakout groups. These breakout groups were organized around the nine draft knowledge areas (KA) from the CEP learning outcomes committee: 1) Cyber Defense, 2) Cyber Operations, 3) Digital Forensics, 4) Cyber Physical Systems, 5) Secure Software Engineering, 6) Cyber Ethics, 7) Cyber Policy, Governance, and Law, 8) Cyber Risk Management, and 9) Behavioral Science.

As a result of processing the expert feedback received through all community engagement activities, the members of the JTF have developed a curricular thought model, a modification of the Next Generation Science (NGS) Standards developed by the U.S. National Research Council. The JTF curricular model like the NGS framework includes “core ideas”, “cross-cutting concepts” and “practices.” Furthermore, the JTF extends the NGS framework with cybersecurity “focus areas” that are connected to “practices”, as depicted in the ACM JTF cybersecurity curricular model.

The cybersecurity “core ideas” will be the finalized knowledge/domain areas, which are still a work-in-progress. Also subject to refinement are the “cross-cutting concepts” that currently include adversarial thinking, risk, confidentiality, integrity, availability, and access control. The JTF defines “practices” as the combination of cybersecurity knowledge and skills connected to “focus areas.”

* + 1. **Data Science Volume**

The charge from the Education Council to the Data Science education initiative led by Boots Cassel and Heikki Topi was to explore the status of data science education and to determine if it would be appropriate to launch a curriculum recommendation effort.

After initial conversations at Ed Council and Ed Board meetings in 2014-2015, Boots Cassel spoke with Paul Tyman of NSF at SIGCSE 2015 and determined that there would be interest at NSF. Boots Cassel and Heikki Topi wrote a proposal to hold a workshop to gather input from a broad range of players in the area of data science education. The proposal gave the following questions to be addressed by workshop attendees:

* Just what is meant by data science? What other terms are used for similar concepts? Is there a common core of features among the varying implementations?
* How much of data science is independent of the application domain?
* What are the specific theories and concepts that provide needed tools and techniques for dealing with large quantities of data?
* What are the general and specific needs of those preparing to work as data scientists to be able to understand and evaluate the implications and potential consequences of their work?

Another meeting goal was to provide recommendations, including:

* Would it be helpful to have a curriculum recommendation for an undergraduate (or master’s) program in data science?
* Is it too early to think about accreditation criteria?

Our proposal was submitted on May 5, 2015, and we received a positive response on June 5, 2015, with funding just under $50,000. Heikki Topi and Boots Cassel then planned the logistics of the workshop, discussed candidates who could contribute to this discussion, explored what is happening in data science education, and issued invitations. The invitations were received with enthusiasm. The final list of participants included representatives from business programs, computing, statistics, and several application areas. Representatives of the relevant societies and from industry were also present.

The workshop was held on October 1-3, 2015. Some of the participants are actively involved in existing data science programs, others have plans to start programs, and yet others are interested at a more meta level. All the attendees proved to be valuable contributors to the discussion.

The sessions at the workshop were recorded and transcribed. Boots and Heikki integrated and interpreted the materials and wrote a draft workshop report. That draft was shared with the workshop participants, and their comments were incorporated into the final version. This was presented to the Education Council in August 2016.

* + 1. **CC2020: Update to CC2005**

Computing Curricula 2005 (CC2005) is an overview volume of the curricular volumes produced by ACM (CS, SE, CE, IT, IS) which is used broadly, especially outside US.

The CC2005 revision grew out of the “Nomenclature report” which was presented to the ACM Ed Council in August 2015. It was felt that many areas of “Computing” had now developed into areas in their own right or new areas had emerged in the field, e.g. Big Data, Cyber Security which were not addressed in the CC2005 report. It was also evident that the names of what is now in computing had changed over the past 10 years.

An informal group was formed to provide feedback on the CC2005 report and whether it really did need updating. The members of the group were tasked to go back to their networks and discuss whether an update was needed.

CC2020 Vision

A steering committee (with a planned maximum of 10 members) has been formed to include geographical representation and as many areas within “computing” as we could cover. This group met face-to-face in August 2016 immediately following the 2016 Education Council meeting. It is envisaged that the people on the Steering group have wide networks both geographically and within their own areas of expertise, to consult on any aspects going forward.

The Members of the new Steering committee are:

Alison Clear, EIT, New Zealand

John Impagliazzo, Hofstra University, USA

Sirdar Iyer – IIT Bombay

Ming Zhang – Bejing University, China

Gerrit van der Geer – HCI

Steve Gordon – Ohio Supercomputer Centre, USA

Stu Zweben – Ohio State (Emeritus), USA

Heikki Topi – IS, Bentley University, USA

Kakehi Katsuhiko, Prof. Emeritus, Waseda University and IPSJ fellow, Japan

Eiji Hayashiguchi, Chief Advisor, Information-technology Promotion Agency, Japan (IPA)

IEEE Computer Society representative Arnold Pears, Uppsala University, Sweden

Unfortunately the IEEE Computer Society now find they do not have the funds to support Arnold at the meeting in August 2016. Allen Parrish will attend instead. We will need to re-examine the makeup of the steering group as we don’t have any Europe representative nor do we have a South American or African representative. While this is not as much as issue in South America and Africa as we have contacts there, we do need coverage of the networks geographically to be able to source opinion and advice from them. However it is essential we have a representative from Europe on the steering group. If Arnold Pears is not able to be the IEEE-CS representative in the future we will need to relook at the makeup of the steering group. We will also be asking the individuals if they can be funded by national associations. The two representatives from Japan will attend the first meeting then tell us who will be the permanent member in the future.

Discussions will be held with leaders at IEEE-CS responsible for their educational initiatives to determine if they may be able to fund a delegation to take part in this effort and be a co-sponsor of the volume going forward.

**Computer Engineering 2016 (CE2016)**

Over the past fiscal year (2015 July 1 – 2016 June 30) the steering committee for the development of the ACM/IEEE curricular guidelines in Computer Engineering has worked to produce a finished report by the end of 2016. In August of 2015 the committee had a face-to-face meeting in Atlanta, Georgia, to consider the results of the survey conducted in the spring of 2015. The effort was very productive, which resulted in a new version of the document.

The new version of the report, dated 2015 October 25, was presented to various groups for discourse and was placed on the CE2016 website for public review and comment. ACM distributed this version to over 500 interested parties. A special distribution also went to the Electrical and Computer Engineering Department Heads Association (ECEDHA). The committee received approximately 30 responses.

A subset of the steering committee (John Impagliazzo, Vic Nelson, Joe Hughes) analyzed these results at the end of January of 2016 during an intense three-day meeting in Atlanta, Georgia. At this meeting, they made hundreds of changes to the document from the survey results. The major changes are as follows.

1. Delete from Appendix B the five-year curriculum sample reflecting the Bologna Accord
2. Add a new section to chapter 4 (section 4.4) to expand the discussion of engineering laboratories, which are critical to any computer engineering discipline
3. Develop a new Appendix C focused on the specific details for developing modern computer engineering laboratories
4. Remove the knowledge area on emerging technologies and rewrite it as a separate section (4.2) in the body of the report

These actions have streamlined the report for the development of a modern computer engineering discipline.

Over the following months, the steering committee modified the document and developed a new version of it, dated 2016 June 11. The committee placed the new document on its public website for a final period of public review and comment. The survey and the document appear at https://www.surveymonkey.com/r/WXGKSZV.

During the 2015-16 fiscal year, members of the steering committee made several presentations to garner global buy-in for the curriculum effort. These include engineering-oriented meetings at the ECEDHA conference in San Diego, IEEE EduCon in Abu Dhabi, FIE in El Paso, workshops at the Chinese Education Conference in Tianjin, as well as other events.

* + 1. **Enterprise Information Technology Body of Knowledge (EITBOK)**

The EITBOK is a joint effort started by IEEE-CS. John Impagliazzo is the ACM liaison from Ed Council.

Considerable effort has been spent defining how this curricula is different from the IT2017.

Major differences are:

* IT2017 is focused on curriculum for college-level IT programs
* IEEE-CS has defined EITBOK as “the whole operation of the IT organization within an enterprise…which spans 3 curricula: IT, IS and SWE”.

No schedule for the production of the final volume has been determined.

* + 1. **Master’s in Information Systems**

A joint ACM/AIS task force has been working on the revised version of the master’s level curriculum recommendation for Information Systems (MSIS) since January 2015. The July 2015 – June 2016 activity year has been particularly intensive, including the following key events and processes:

1. In summer 2015, the task force released its first public deliverable, which outlined the assumptions and principles underlying the task force’s work, proposed a set of differences between the current and new MSIS curriculum, defined a schedule for the development process, provided background regarding the current global regional practices for MSIS, and described the fundamental characteristics of the proposed competency-based approach to curriculum development. It also provided the first thoughts regarding the most important competencies of MSIS 2016 graduates.
2. Building on the Summer 2015 deliverable and earlier panel discussions at ECIS and PACIS 2015 conferences, the task force presented its work at the August 2015 AMCIS conference in a panel that brought together members of the task force and external experts for a direct, focused, and helpful exchange of ideas. In a similar way, presentations and conversations at the 2015 MIS Academic Leadership Conference and the AIS SIG-ED 2015 conference provided the task force highly valuable guidance for its work.
3. In fall 2015, the task force organized its first survey for academic and practitioner audiences, the results of which provided further direction for the development of the curriculum.
4. In December 2015, the task force had its second face-to-face meeting in the context of the ICIS 2015 conference. This meeting focused on the underlying curriculum architecture and further development of the details of the MSIS 2016 competency hierarchy.
5. In January-February 2016, the work on the competency hierarchy continued, leading to a March 2016 release of the task force’s second public deliverable, which proposed MSIS 2016 competencies, organized into areas and categories. This document also formed the foundation for a detailed second survey targeted to both academic and industry audiences. The survey was conducted in April-May 2016. Highly interactive panel sessions at ECIS 2016 and PACIS 2016 provided additional feedback to the task force.
6. Finally, in May-June 2016 the task force created the first comprehensive version of the curriculum document, making it available for public review in mid-July 2016 as the third public deliverable of the task force. The draft curriculum builds on four earlier master’s level curricula in Information Systems. It is, however, is a brand new document, without any material directly from the earlier versions.
   1. **International activity**

**1.7.1 European efforts**

Computing education activities involving ACM Europe are carried out in conjunction with Informatics Europe, a group of (some) Heads of Computing Departments in Europe. A joint committee has been set up for this purpose; it is entitled the Committee on European Computing Education or CECE for short. For completeness the current membership of CECE is

From ACM Europe:

[Michael Caspersen](http://cs.au.dk/~mec/), Aarhus University, Denmark (Co-Chair)

J[udith Gal-Ezer](http://www.openu.ac.il/personal_sites/judith-gal-ezerE.html), Open University of Israel, Israel

[Michael Kölling](http://www.cs.kent.ac.uk/people/staff/mik/), University of Kent, UK

[Andrew McGettrick](http://www.cis.strath.ac.uk/cis/staff/index.php?uid=andrew), University of Strathclyde, UK

From Informatics Europe:

[Jan Vahrenhold](http://www.uni-muenster.de/Informatik.AGVahrenhold/personen/prof.dr.janvahrenhold/index.html), University of Münster, Germany (Co-Chair)

[Cristina Pereira](http://www.informatics-europe.org/about-informatics-europe/ieu_board.html), Informatics Europe, Switzerland

[Gérard Berry](http://www-sop.inria.fr/members/Gerard.Berry/), INRIA, France

[Enrico Nardelli](http://www.mat.uniroma2.it/~nardelli/), University of Rome Tor Vergata, Italy with [Mirko Westermeier](http://www.uni-muenster.de/Informatik.AGVahrenhold/personen/mirkowestermeier.shtml),

University of Münster, Germany (research assistant)

*Study on Informatics Education in Europe*

Originally this was conceived as a two-year project, funded jointly by ACM Europe and Informatics Europe. The work is being carried out at the University of Munster by Mirko Weistermeier under the guidance of Jan Vahrenhold. It was due to run from 1st April 2014 until 31st March 2016. However, due to a late start the work is now expected to complete late in summer 2016. It is anticipated that there will be a report together with an interactive map displaying information about the state of education in digital literacy and informatics across European countries.

* + 1. **Developments related to India**

The committee had identified three areas to focus on:

* Faculty Development Programs (FDP)
* Bringing ACM 2013 curriculum to UG institutes in India
* Bringing computing to school

Two FDPs on algorithms and advanced algorithms were conducted, a sample O/S curriculum has been created and we have launched CSPathshala, an initiative to bring computing to schools in India. CSPathshala is being piloted in 15 schools.

Faculty Development Program

India has several universities that offer undergraduate computer science degrees, but do not have adequate experienced teachers. FDPs will expose these teachers to expert teachers’ views on how difficult topics can be taught. A team, jointly headed by Dr. Sachin Lodha from TCS Research and Dr. Chitra Babu, head of CS Department, SSN College of Engineering, was tasked with organizing FDPs across the country. Both of them have successfully conducted FDPs in the past. Three FDPs were organized on algorithms in various regions. The feedback from the participating faculty has been good. These were organized by three different ACM chapters and one of them was delivered in a blended mode. The FDPs have been recorded and we will be uploading the content online for easy access by the participants as well as others. Going ahead we will be working with some faculty from these institutes to formally assess the impact of these FDPs. We will also conduct five more FDPs next year.

CSPathshala

Several schools have introduced IT, however there is neither a uniform curriculum nor a clarity on what is to be taught. In an attempt to bring some uniformity in curriculum and influence the quality of content being taught we have started an initiative: CSPathshala. We have mobilized a team of 50 volunteers to help create a detailed curriculum for standards 1-8. Today, we have detailed material for one unit of standards 1-5 that is being piloted in 15 schools in Pune. The content created by the volunteers include a detailed presentation for each period and a lesson plan to help the teacher navigate through the presentation. We also have worksheets that list a couple of problems for the students to solve. The plan is to complete the content for all units by October so that these 15 schools have enough material for the entire year. To spread the message to schools we organized two workshops - one in Pune and the second in Delhi. In Pune we also conducted training for the teachers of these 15 schools. In the next academic year we plan to add 35 more schools covering the regions of Delhi, Cochin and Bangalore. As a first step we will hold workshops in Cochin and Bangalore along the lines of the workshops held in Pune and Delhi. The audience for these workshops are primarily teachers and principals of schools in the region. The speakers are academics and industry representatives who present the importance of teaching computational thinking to children.

Undergraduate Curriculum

A team is looking at the best way to bring the ACM CS 2013 curriculum to institutes in India. A syllabus for teaching operating systems has been created. The main contribution has been to take the CS 2013 curriculum and define a syllabus for operating systems. The proposed syllabus is undergoing review. Once the reviews are completed a set of guidelines to arrive at syllabus for other subjects will be created and we will approach volunteers to create syllabi for other subject. The next set of subjects being considered are - Data structures, Algorithms and Software Engineering.

**1.7.3 Developments related to China**

In the year 2015-2016, the ACM China Subcommittee on Education is mainly focused on understanding *ACM/IEEE Computing Curricula.*

Seven professors from the advisory committee of MOE China and seven other professors worked on the translation of CS2013 which was finally released in November 2015. More and more universities will refer to ACM/IEEE computing curricula reports. Faculty members use these reports to adjust the contents of their programs according to their specific circumstances

On 23rd-24th April 2015, the Workshop on ACM/IEEE Computing Curriculum standards (CE2016 and IT 2017) was held in Chengdu, China. Prof. John Impagliazzo of Hofstra University introduced both CE2016 (Computer Engineering) and IT2017 (Information Technology) curricular guidelines. Prof. Weidong Liu from Tsinghua University is one of the CE 2016 committee members, while Prof. Ming Zhang from Peking University is one of the IT 2017 steering committee members. About 20 Chinese professors participated in the workshop and some of them introduced the detailed Computer Science education programs in their own universities respectively.

On October 22th 2015, the “Forum of Elite female IT professionals” was held successfully by the “CCF subcommittee of Female Computer Professionals” during the China National Computer Congress (CNCC). Prof. Ming Zhang made a keynote speech on “More importance should be attached to computer education research”. She introduced the ACM/IEEE Computing Curriculum, the CS programs at Peking University and top computer education research communities and conferences. She also expounded on the concept of innovation and entrepreneurship education.

On 29th November 2015, the ACM China Subcommittee on Education held the China Computing Education Summit in Tianjin. The theme of this first summit was *ACM/IEEE Computing Curricula and China Computing Curricula Guidelines Development.* Prof. Mehran Sahami from Stanford University, Prof. John Impagliazzo from Hofstra University, Prof. Heikki Topi from Bentley University were invited to introduce the ACM/IEEE Computing Curricular guidelines. Over 80 teachers attended the workshop. The summit produced positive effects on accelerating the development of computing education in China.

In addition, the application for the SIGCSE China Chapter has been submitted.

**1.8 Improving Understanding of the Computing Education Landscape (NDC)**

The Non-doctorial Granting Department in Computing (NDC) study continues to evolve and improve. The steering committee is made up of Stu Zweben, Jodi Tims, and Yan Timanovsky.

The highlights this year include:

* Survey conducted during spring semester
  + Somewhat shorter basic survey
  + Clarification of meaning of some elements
  + Previous year data available to last year’s respondents
* Addition of simultaneous Enrollment Survey to CS units
* Fewer academic units responded to NDC compared with 2015
* Fewer programs represented by this year’s respondents
* Report completed in time for publication in September Inroads
* Survey of non-respondents

Finding include:

* Bachelor’s programs responding successive years (73 CS, 16 IS)
  + 15.2% increase in CS degree production [2013-14 vs 2014-15]
  + only 5.5% CS enrollment increase and flat # new majors [Au 2014 vs 2015]
  + 10.2% enrollment decrease and 39% decrease in new majors in IS!
* Diversity in bachelor’s degrees – NDC vs Taulbee
  + No difference in gender diversity overall (16.3% female)
    - CS gender diversity still higher in NDC than Taulbee (17.4% vs 15.7%)
  + Greater ethnic diversity in NDC
    - 18.1% NDC vs 15.6% Taulbee (Black, Hispanic, Amer. Indian, Islander, 2 or more)
  + NDC units graduated fewer Asians and non-residents, and more Whites, than do Taulbee units
* Faculty
  + Increase in both T-T and part-time/adjunct avg FTE per unit
  + 78% success rate in hiring T-T faculty (vs 91% previous year)

**1.9 Promoting new curricular themes and strategies**

The continuing concerns about broad participation in computing 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.

**1.10 ACM Conference on Learning at Scale**

The Learning @ Scale (L@S) conference, underwritten by the Education Board, continued to run well this past year.  The third conference in the series, the 2016 Learning @ Scale conference was held April 25-26 in Edinburgh, UK.  The conference was co-located with the Learning Analytics and Knowledge (LAK) conference to continue to foster ties between the Learning @ Scale community and other research communities focused on computing and education.  A total of 141 attendees (including 38 students) registered for L@S 2016, yielding a total of $38,700 in registration revenue.  Sponsors for the conference provided a total of $32,500.  While this was roughly half the level of sponsorship as in previous year, the total revenue (between registrations and sponsorships) was sufficient to make the conference slightly revenue positive.  Expenses for the conference were $69,275, resulting in a small surplus of ~$2,000 for the 2016 event.  Prior to 2016, there was roughly an $80,000 budget surplus from the first two offerings of the L@S conference.

* 1. **Taskforces**
     1. **Diversity in Computing**

The Diversity Group seeks to identify initiative areas that will be of benefit to Council, Board and ACM in general. We seek out important and timely diversity projects that we are particularly suited to contribute to.

The group met by phone multiple times during Fall 2015 and Spring 2016. During those conversations we discussed a variety of important computing education diversity issues that had yet to be fully addressed by any existing organization.

Gaining an understanding of what diversity in CS means outside the US would benefit the ACM as it continues to expand its international membership and programs. Thus, we identified our first project. We are coordinating with the CSTA on the development of diversity questions to be included in the international teacher survey they plan for distribution in Fall 2016. The knowledge that we gain from the teachers’ perspective and experiences will inform the next stage of our project. We are tentatively defining “diversity issues” as referring to access and representation.

In support of this goal, the group has taken on two parallel tasks. The first task is to identify existing literature on international diversity – what is known and documented? Are there any great programs that are being implemented now to address issues of access and representation? Are there any access/representation problems that have been solved by awesome programs? If so what are the problems and programs? Very importantly: how “solid” is all this information? That effort is underway.

The second task is to come up with a rough set of questions for the CSTA survey, and to work with Mark Nelson on the refinement of those questions and their inclusion in the survey. That effort has begun in earnest this summer. The developers of the ACM Europe Computing Education survey have shared the question and answer wording from their survey with the Diversity Group. Although their survey has completed data collection and did not include specific diversity questions, nonetheless this information should be very useful for the Group and by extension to the CSTA.

* + 1. **Capacity building in computing programs**

Members: Eric Roberts (chair), Owen Astrachan, Valerie Barr, Tracy Camp, Boots Cassel, Lissa Clayborn, Dan Garcia, Dan Grossman, Mark Guzdial, Rich LeBlanc, Andrew McGettrick, Alison Derbenwick Miller, Peter Norvig, Debra Richardson, Mehran Sahami, Ben Shapiro, Larry Snyder, Chris Stephenson, Stu Zweben

The Subcommittee on Building Capacity in CS Education was formed at the Education Council meeting in Denver in August 2015 in response to the growing imbalance between the number of students taking computer science courses and the number of faculty available to teach those courses.  According to the CRA Taulbee survey, the number of students majoring in computer science has risen every year since 2007, often by double-digit percentages in a single year.  Over that same period, faculty numbers have risen very slowly, if indeed they have risen at all.  The end result is that faculty in computer science are responsible for teaching more and more students each year.  That problem is exacerbated by the fact that the number of open positions for computer science faculty significantly exceeds the number of qualified applicants for those positions, making it difficult for institutions to hire additional faculty.

The capacity problem is now widely recognized and has been taken up by a number of organizations.  Tracy Camp and Stu Zweben—both members of our subcommittee—are chairing a CRA committee seeking to gather data about the capacity imbalance.  Eric Roberts and Tracy Camp have also been appointed to the National Academies Committee on the Growth of Undergraduate Computer Science, which is in the process of preparing a report scheduled for release in late 2016.  Roberts has completed an extensive white paper on the history of the problem and has circulated that to the ACM subcommittee, which is in the process of brainstorming solution strategies for the crisis.

* 1. **Engagement with SIGs**
     1. **SIG CAS (Computers & Society)**

SIGCAS has chosen to participate in the Education Council committee on diversity. One project involves the development of a small set of questions to be added to a questionnaire being crafted by CSTA and being sent to non-US constituents in the K-12 space. As part of that endeavor, SIGCAS has participated in building a bibliography looking at ongoing and reported projects related to the international K-12 space and in sampling of K-12 constituents.

In addition, these findings will be shared with the SIGCAS community through several tweets on the SIGCAS twitter feed and an article for inclusion in a future SIGCAS Bulletin Newsletter.

* + 1. **SIGCHI (Computer-Human Interaction)**

SIGCHI’s Education project for human-computer interaction (HCI), running from 2011-2014 resulted in:

* a final report published in 2015 and to be downloaded in PDF from:

<http://www.sigchi.org/resources/education/2011-education-project-1/research-reports/final-report-on-sigchi-education-project-2011-2014/view>

* a website compartment:

<http://www.sigchi.org/resources/education>

* a volunteer follow-up SIGCHI Community on Education:

<http://www.sigchi.org/communities/hci-ed>

* The community is currently organizing a workshop during the conference AfriCHI (21st - 25th November 2016 - Nairobi, Kenya) entitled “Teaching HCI: A Living Curriculum?”:

[http://africhilivingcurriculum.wikispaces.com/](https://webmail.login.vu.nl/OWA/redir.aspx?SURL=M861OQPfi-wyZoQx48Ox8U75X6qPrIamqHRKSHTMhT4o-_TgHa3TCGgAdAB0AHAAOgAvAC8AYQBmAHIAaQBjAGgAaQBsAGkAdgBpAG4AZwBjAHUAcgByAGkAYwB1AGwAdQBtAC4AdwBpAGsAaQBzAHAAYQBjAGUAcwAuAGMAbwBtAC8A&URL=http%3a%2f%2fafrichilivingcurriculum.wikispaces.com%2f)

* + 1. **SIG CSE (Computer Science Education)**

The SIGCSE community continues to be very active and a strong partner with the Education Council. This year’s highlights:

SIGCSE Conferences

* The SIGCSE Technical Symposium was held on March 2-5, 2016 in Memphis, TN, USA. There were around 1,300 attendees.
* The conference on Innovation and Technology in Computer Science Education (ITiCSE) was held on July 11-13, 2016 at San Pablo Catholic University, Arequipa, Peru. This is the first time this conference was held outside the vicinity of Europe. A board decision was made to keep ITiCSE in the vicinity of Europe for the next 5 years. Other options for global conferences will be explored.
* The International Computing Education Research (ICER) Workshop, August 9-13, 2015 Omaha, Nebraska. There were around 120 people in attendance.

In-cooperation (with SIGCSE) status was approved for a number of conferences in FY16

* The First National Computing Colleges Conference (NC3 Saudi Arabia 2016), February 17-18, 2016, Jedda, Saudi Arabia
* The European conference, Koli Calling ‘16
* The Western Canadian Conference on Computing Education (WCCCE’16)
* Several Consortium for Computing Sciences in Colleges (CCSC) regional conferences including CCSC-MW ‘16, CCSC-SE’16, CCSC-NW’16, CCSC-EA’16, CCSC-RM’16, CCSC-MS’16, CCSC-NE’16, CCSC-SW’16, CCSC-CP’16, and CCSC-SC’16
* First Annual Conference on Research on Equity and Sustained Participation in Engineering, Computing, and Technology (RESPECT 2015)
* Australasian Computing Education Conference (ACE’16)

Programs

* Twenty-seven applications were received in FY 2016 with six projects funded for a total of $21,789.
* The Speaker’s Fund was used to support the dissemination of outstanding SIGCSE Symposium, ITiCSE, or ICER presentations to in-cooperation conferences. Speakers were supported for two conferences in FY 2015 for a total of $1,221.36.
* As of March 2016, speakers had been supported for two conferences for a total of $2,000.
* The Travel Grant Program supports first-time attendance at the SIGCSE Symposium for faculty and K-12 teachers by providing $500 for travel. Six awards were made to support attendance at the 2016 SIGCSE Technical Symposium.
* The annual Doctoral Consortium was held in conjunction with the 2015 International Computing Education Research (ICER) Workshop in Omaha, Nebraska. There were around 20 participating doctoral students.
* A New Educator’s Workshop was held in conjunction with the SIGCSE Technical Symposium on March 2, 2016 in Memphis, TN. The workshop provided information important to computing educators who are new to academia or who will seek an academic position in the near future. Thirty-five applications were accepted, eleven of them from graduate students. The graduate students received partial scholarships to attend.

Committees

The Board approved the formation of two new committees:

* The Committee on Computing Education in Liberal Arts Colleges which aims to be a voice for the liberal arts community and a network for sharing ideas. Facilitators: Doug Baldwin, SUNY Geneseo; Alyce Brady, Kalamazoo College;, Andrea Lawrence, Spelman College; Henry Walker, Grinnell College
* The Committee on Instructional Practices which will gather data on instructional practices common to computer science educators. Leaders: Scott Grissom, Laurie Murphy, Renee McCauley and Sue Fitzgerald
  + 1. **SIGHPC (**High Performance Computing)

Over the past year, there have been a number of efforts by SIGHPC and the SIGHPC Education Chapter to support computational science education. These have included the initiation of an international fellowship program, an online seminar series on computational science education, and the initiation of a discussion on computational science education issues.

ACM SIGHPC/Intel Computational & Data Science Fellowships

This year SIGHPC and Intel initiated a new fellowship program in computational and data science aimed at increasing the diversity of students pursuing graduate degrees in these fields. The program will award a $15,000 stipend beginning in August, 2016. The fellowship deadline for this year was April 30 and the winners will be announced by July 31. Information on the program can be found at <http://www.sighpc.org/fellowships>.

Seminar Series

The SIGHPC Education Chapter, the first virtual chapter of the ACM, has engaged its members through an online education and training webinar series featuring speakers from both academic and nonacademic institutions. A list of the webinars from this year can be found on the chapter website http://sighpceducation.acm.org/ along with pointers to the YouTube videos of the sessions.

Training and Education Resources

Another activity that was initiated this year was the listing of relevant education and training materials on computational science. The list includes pointers to databases and other collections of educational materials that can be integrated into existing classes to help students achieve competencies in computational science. In addition, it lists online training and workshop materials relating to a variety of technical and programming skills. A committee of chapter members has been assembled to locate and review additional materials.

Blog and Forum

Finally, the chapter has started a blog and forum to further engage the membership in discussions about computational science education and training. These are available at http://sighpceducation.hosting.acm.org/wp/ and welcome the participation of both members and nonmembers of the chapter with an interest in this topic.

Birds-of-Feather Session at Supercomputing

The chapter participated in the annual meeting of SIGHPC at the SC2015 meeting in New Orleans. In addition, we led a BOF session on computational science education at that meeting.

* + 1. **SIGGRAPH (**Computer GRAPHics and Interactive Techniques)

This past year, the work of the SIGGRAPH with respect to the Education Council included representation on ACM Education Task Force on Community College Curriculum Development: Computer Science and Cybersecurity by Colleen Case, previous year Chair of the Education Committee and representative to the Council. She helped accomplish the work of the Task Force, including review of key documents and curricular guidelines, specification of new learning objectives, and development of rubrics. Her participation is an ongoing resource for the SIGGRAPH Education Committee. Her knowledge of the work process and continued active role on the Committee provides valuable guidance. The SIGGRAPH Representative attended the March 2016 Ed Council meeting in person at SIGCSE.

* 1. **Enhancing the effectiveness of the Education Board and Education Council**

In response to requests from members of the Education Council about better communications mechanisms, steps have been taken to provide updates on computing education matters; in particular the Board continues to provide column, called “EduBits,” in each edition of *Inroads.*

**Section Two**

**2. Priorities for FY 2017**

* 1. **Comment on the priorities of the Board**

During the previous FY much progress was made on a number of fronts with work. New members of the Education Board and Education Council is now in place. Over the coming months new priorities will have to be established.

**2.2 Forthcoming Education Council activities**

New initiatives for FY2016 include:

* Global issues – identify international conferences that it would make sense to have educationally-minded people attend. How can ACM support this?
* Ethics and social issues – help organize workshops at various SIG conferences to train educators to incorporate ethics into their courses
* Computing education research – explore the creation of a new computing education research conference with inclusion from the computing and learning science
* Multidisciplinary computing – investigate exemplars for multidisciplinary computing programs at various universities
* Machine learning and software engineering – explore what, if anything, the Education Council might do in this emerging area.

More details:

* Continue development and/or release of curriculum volumes including Computer Engineering 2016, Information Technology 2017, Enterprise Information Technology Body of Knowledge, Masters of Science in Information Science 2016
* Begin work on curricular volumes related to Cybersecurity and Data Science
* Development of a Memo of Understanding Between the ACM, AIS, and IEEE CS regarding a joint effort on Cybersecurity curricula.
* Engage with Code.org and other organizations to promote adoption of “A Framework for K-12 CS Education”
* Continue to work on the Advanced Placement initiative and with CSTA; this is ongoing and involves members of Ed Board / Ed Council
* Help India implement CS2013 into their undergraduate curriculum
* Continue support for Learning at Scale conference
* Continue support for the NDC (Non-Doctorial granting departments in computing) Study

The next meeting of the Education Council is planned for late summer 2017.

**2.3 Supporting K-12 efforts**

*AP and CSTA initiatives*

* Various members of the Education Council continue to be 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.
* CSTA Executive Director Mark Nelson provided four priorities for its coming year:
* Research: to increase CSTA’s capacity for research on CS education.
* Diversity-Equity-Inclusion: to build upon the work of others and not reinvent the wheel.
* Standards supporting CS certification or licensure.
* Building awareness, particularly as CS that is a field that does more than “just coding.”
* The Education Council will continue to provide support and guidance for the Cutler Bell award and CS Education Week.
* Work on the Framework for K-12 CS Education will continue. The framework has undergone three public reviews and will be published in September 2016. A number of international reviews have taken place including New Zealand, UK, and Germany. More than 20 advisors from higher education and CS education research are involved, (including Mehran Sahami who worked on the CS2013 Undergraduate Curricular Recommendations.)
  1. **Plans of the CCECC**

The CCECC plans to pursue the following activities in FY17 (July 1, 2016 – June 30, 2017):

Finalize the revision to the 2009 Associate-degree Curricular Guidance in Computer Science with contemporary cybersecurity learning outcomes, dubbed CS-Cyber.

* IronDog draft and final versions
* Begin new associate-degree curricular guidance in Cybersecurity based on work of the ACM JTF for Cybersecurity Education
* Continue to grow international perspectives to the Committee’s work
  + o ITiCSE 2016 invited panel, “Global Perspectives on the Role of TwoYear/Technical/Junior Colleges in Computing Education”

• Continue recruiting and mentoring new CCECC members

• Ongoing maintenance of committee website <http://ccecc.acm.org/>

• Continue maintenance and growth of database contacts of community college computing educators

• Continue serving on the ACM Education Board (Elizabeth Hawthorne)

• Continue serving on the ACM Education Council (Cara Tang)

• Continue serving on the ACM Education Policy Committee (Elizabeth Hawthorne)

• Continue serving on the ACM-W Council (Cindy Tucker) and collaborating with

ACM-W

• Continue serving on the JTF for Information Technology (Cara Tang)

• Continue serving on ACM JTF for Cybersecurity Education (Elizabeth Hawthorne)

• Continue collaborating with CSTA

• Continue a variety of advocacy and outreach efforts on behalf of computing

education in the community college sector, such as various conferences, articles,

meetings, and workshops

• Continue communications with colleagues via the quarterly Community College

Corner column in *ACM Inroads*

• Ongoing community-building, outreach, and dissemination activities, including

conference sessions, periodic mailings and email messages to contacts in the CCECC

educator database, website enhancements, articles, and exchanges and

collaborations with colleagues.

• Ongoing support for the ACM Education Council and Education Board goals and

objectives.

* 1. **Undergraduate curriculum efforts**

*Computer Engineering 2016 (CE2016)*

The goal over the next half year (2016 July to December) is to receive provisional approval from the ACM Education Council in August, collect as many survey responses as possible with a September 30 deadline, meet in October as a subcommittee to finalize the report, seek IEEE Computer Society approval, and publish the document.

*Information Technology 2017 (IT2017)*

The task group has scheduled its next 2 ½ day face-to-face meeting in Boston on October 1-3, 2016, following the SIGITE/RIIT conference. The goal of the meeting is to assess the public feedback and plan the last phase of developing the final draft of the report. After the last public review and comment period to be scheduled in Dec 2016 through January 2017, the task group will finalize the report and submit it for the ACM/IEEE-CS endorsement in summer 2017.

*Cybersecurity*

Interest in cybersecurity education has led to the Board supporting a curricular volume on Cybersecurity education at the undergraduate level. The Joint Task Force on Cybersecurity Education (JTF) was chartered by the ACM Education Board in September 2015 with the expressed purpose of developing comprehensive, undergraduate curricular guidance in cybersecurity education to support future program development and associated educational efforts. Work is now underway with the goal to completing these guidelines in 2017.

*CC2020 – Review and Update of CC2005*

Members of the steering group will be tasked with gathering information prior to the August 2016 meeting and it is envisaged that a project timeline, data collection in the forms of survey and interviews and data analysis will be prepared over the following 12 months.

A document will be produced detailing the areas of “computing” including the five already approved curriculum (CE, CS, SE, IS, IT) and the two new areas approved for curriculum development, Cyber Security and Data Science.  However this new document will be able to accommodate future areas which may appear before 2020 and after 2020.

*Data Science*

The workshop attendees did vote that some type of curriculum recommendation would be useful now. However, there were many caveats to that conclusion and those need discussion and analysis to determine the way forward. The workshop participants also were strongly in favor of activities that lead to improved sharing of ideas, experiences, and materials between early stage degree programs in data science. The workshop attendees agreed that the field is not ready for accreditation.

The task for 2016 – 2017 includes wide distribution of the workshop report with the intent of engaging a broader group of participants in the conversation on the direction of data science education.

Following analysis of the response to the report, Boots Cassel and Heikki Topi will present a recommendation for further collaborative action by ACM and other appropriate societies to create a curriculum guidance document to support the development of high-quality degree programs in data science.

**2.6** **Master’s guidance on Information Systems**

The ACM/AIS Joint Task Force expects to complete the following activities:

1. The task force will have its third face-to-face meeting in the context of the AMCIS 2016 conference. At this meeting, the task force will process the feedback it will receive based on the July 2016 draft and form the foundation for writing the final draft.
2. The task force will present its work at the ACM Education Council meeting in August 2016.
3. The task force hopes to complete the final curriculum document in September 2016 so that it can submit its work to the ACM Education Board and Council and the AIS Council for evaluation, final feedback and changes, and­—we hope—eventual approval.
4. If the Summer/Fall 2016 process moves forward as planned, the revised MSIS curriculum will be launched globally in December 2016 in the context of the ICIS 2016 conference in Dublin.
5. The task force will also be working on the dissemination of the results of its work throughout the year, first to solicit final feedback and then to encourage the adoption and use of the MSIS 2016 curriculum recommendation.
   1. **Educational plans of SIGs**
      1. **SIGGRAPH**

ACM SIGGRAPH has a strong commitment to education, outreach and collaboration across disciplines. In particular, the ACM SIGGRAPH Education Committee has 20 members and strong connections to academic institutions and industry. There is strong interest in working with the ACM Ed Council on two initiatives in particular for the coming year:

Virtual Reality/Augmented Reality Curriculum and

      CS + STE(A)M (A for Arts of course) issues.

The boom in Virtual Reality/Augmented Reality (VR/AR) signals a new era in graphics education calling for expertise in best practices from established programs and movement towards a standard curriculum. Courses in the foundation of these areas have been a staple at the SIGGRAPH annual conference for many years. We hope to curate and organize this content to make it more broadly accessible. We plan to create opportunities to have meaningful conversations on these topics from the point of view of the many disciplines that touch VR/AR such as vision science, psychology, creative writing, physics, electrical engineering as well as the core computing topics of geometric modeling, rendering, high performance computing, data visualization, and interactive techniques.

SIGGRAPH has been doing CS + Arts for many years now and cross-discipline work is at our core. Our annual conference includes professionals from design, architecture, vision science, engineering, creative writing and more.  Establishing these programs is difficult on many levels and we want provide resources and guidance to those wanting to establish cross-disciplinary programs and those wanting to introduce CS into non-traditionally CS programs. We hope to develop stronger relationships with other SIGS in order to mutually share successful models and lessons learned.

We have recruited a new member to our Education Committee positioned to serve as our SIGGRAPH representative for the coming year, Tabitha Peck, Assistant Professor in the department of Mathematics and Computer Science at Davidson College. Tabitha will be an asset in both of these areas by her research background and by current faculty position.

* + 1. **SIGHPC**

In the coming year, we expect to continue all of the activities from last year. There will be a new round of fellowship applications following approximately the same schedule as last year. We are currently seeking additional speakers for the seminar program and new materials to add to the list of resources. We will be inviting professionals from a variety of backgrounds to provide their perspectives in the blog and encourage participation in forum discussions. We also plan to sponsor a BOF session at the SC2016 meeting in Salt Lake City in November.

Beyond these activities, we hope to engage our members to actively participate in a variety of focused discussions on computational science education and training, depending upon their own interests. We hope to introduce those discussions by recruiting seminar speakers on specific topics with a set of follow-up postings in the blog and forum area. We will also be expanding our presence in social media to help engage the membership and larger community in our activities.

* + 1. **SIGCSE**

Major New Initiatives

* There is strong interest in offering an ITiCSE-like global conference outside the vicinity of Europe. Both China and India have expressed interest. The 2016-2019 SIGCSE Board will examine alternatives.

SIGCSE Conferences

* The SIGCSE Technical Symposium, March 8-11, 2017, Seattle, WA, USA.
* The conference on Innovation and Technology in Computer Science Education (ITiCSE), July 1-7, 2017, Bologna, Italy.
* The International Computing Education Research (ICER) Workshop, September 9-11, 2016, Melbourne, Australia.
* The International Computing Education Research (ICER) Workshop, Summer 2017, Tacoma, WA.

In-cooperation (with SIGCSE) conferences in 2017

* SIGCSE will continue to offer in-cooperation status to a number of regional CCSC conferences and other international conferences.

**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 continue to work with ACM India and ACM China and support their educational activities.
  + China activities:
    - Chinese Computing Curricular Guidelines for bachelor degrees in computer science under 3 categories: system, software, application.
    - SIGCSE China Chapter
    - Educational workshop in ACAC (ACM China Annual Conference) May 2017, Shanghai
    - November 2016, ACM Education China annual meeting, co-located with the 12th China University Course Forum on Computing.
  + India activities:
    - Extend CSPathshala to fifty schools
    - conduct five more FDPs
    - create sample curriculum for other subjects.
  + European activities:
    - To complete a two-year study involving a deep assessment of the state of informatics education within each European country; note the parallel with the ACM / CSTA study *Running On Empty: The failure to Teach K-12 Computer Science in the Digital Age.* See runningonempty.acm.org
    - To give consideration to creating a new high profile computing education conference within Europe
  1. **PACE**

The following 3 items are the result of the August 2016 meeting. Further investigation into the viability of each item will be pursued this year:

* Make sure that we have addressed any explicit promises we may have made in the context of the 2014 PACE workshop on computing education research and followed up appropriately.
* Develop the workshop idea described above further and explore a) member organizations’ interest in participating; b) needed organizational structure; and c) possible funding models.
* Explore ACM’s interest in hosting a similar meeting in the context of the 2017 Education Council meeting (because of the cost and time efficiency of the model).
  1. **Promoting new curricular themes and strategies**

Curricular areas including Data Science and Cybersecurity will be expanded.

The Data Science group plans include:

The workshop attendees did vote that some type of curriculum recommendation would be useful now. However, there were many caveats to that conclusion and those need discussion and analysis to determine the way forward. The workshop participants also were strongly in favor of activities that lead to improved sharing of ideas, experiences, and materials between early stage degree programs in data science. The workshop attendees agreed that the field is not ready for accreditation.

The task for 2016 – 2017 includes wide distribution of the workshop report with the intent of engaging a broader group of participants in the conversation on the direction of data science education.

Following analysis of the response to the report, Boots Cassel and Heikki Topi will present a recommendation for further collaborative action by ACM and other appropriate societies to create a curriculum guidance document to support the development of high-quality degree programs in data science.

The next steps for the Cybersecurity group include:

* Establishing Industry Advisory and Global Advisory Boards
* International Survey, Sept. 2016
* Community Engagement: U.S. and Abroad
* NICE conference, Nov 1-2, 2016, Kansas City, MO
* *ACM Inroads* EduBits column, Dec. 2016 edition
* Initial Public Draft (v.1) for Review and Comment, Dec. 2016
* SIGCSE Special Session proposal, March 8-11, 2017, Seattle, WA
* IFIP WISE conference, WG 11.8 workshop, May 29-31, 2017,   
  Rome, Italy
* Final Public Draft (v.2) for Review and Comment, June 2017
* Endorsed Curricular Guidelines in Cybersecurity (CSEC), Dec. 2017
  + “Living document” – perhaps in XML format
  1. **ACM Conference on Learning at Scale**

The 2017 Learning @ Scale conference will be held April 20-21 in Cambridge, MA at the MIT campus.  The PC chairs for the conference are Justin Reich (MIT) and Candace Thille (Stanford), and the full program committee has already been confirmed.  The Call for Papers for the conference has been widely circulated and the conference website is live at: <http://learningatscale.acm.org/las2017/>.  The deadline for research paper submissions is October 25, 2016.

Additionally, the Learning @ Scale Steering Committee approved a charter for the steering committee which identified regular committee position as well as terms of service for all committee members, and a rotation process for new members.  The Steering Committee has had discussions about models for the conference going forward, including whether Learning @ Scale should form its own SIG (or perhaps a new Emerging Interest Group), move under the umbrella of an existing SIG (perhaps SIGCHI or SIGCSE), or remain as being underwritten by the Education Board.  This is still an area for discussion and no particular direction has been chosen as this time.

* 1. **Taskforces on Diversity and Capacity**

***Capacity Task Force***

Based on significant interest at the September 2014 Ed Council meeting, a task force was formed to consider the problem of diversity in CS. This group has conducted several conference calls to discuss issues with the view to consider what problems are feasible for Ed Board to take on. These recommendations will eventually lead to a white paper. Ed Council members working on the task force include Lisa Kaczmarczyk, Barbara Boucher Owens and Andrea Miller.

A panel presented on diversity in CS at the RESPECT conference with members of the Ed Council participating. One of the ideas was to engage with the ACM Practitioners Board to gain its perspective on diversity issues.

In addition, we need to consider different issues that may arise at research universities (e.g., pipeline of PhDs), smaller schools, and community colleges.

***Capacity Task Force***

In addition, the growing CS enrollments cause some programs to create barriers to entry (e.g., minimum GPA requirements in early classes). This tends to favor students from advantaged backgrounds and men who are more likely than women to have gotten prior exposure to computing. Because of this concern, Eric Roberts is leading a working group for on-going discussions on this topic.

**2.13 Extending the leadership role**

The Education Board needs to continue to be alert to enhancing its leadership role. The first year of the Education Council rotation plan. Changes were made without issue. A new Education Board member rotation policy was executed. New members were welcomed, old members were thanked for their service, movement between the Education Board membership and the Education Council membership were implemented. In addition, the position of Vice-chair in the Education Board was created to provide additional support to the chairs.

New members to the Council and Board were chosen with serious thought to both gender and geographic diversity. This rotation plan will continue to be executed in the coming year.

**2.14 Continuing to foster a positive image of computing**

The Education Board/Council continues 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.

Having said this, there is evidence that, for some institutions, the number of students seeking to pursue computing degrees is swamping faculty and departments.

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.

**2.15 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. The Learning at Scale conference, for instance, is likely to be of considerable significance to ACM well beyond the Education Board.
* The Education Board/Council need to continue to ensure that they have firmly established 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.

*Acknowledgments*

This report has relied heavily on the work of many people – all of the members of the Education Board and Council have provided significant information and particularly Yan Timanovsky and Mehran Sahami.

**Appendix A – Education Board and Council Membership FY2016-2017**

|  |  |  |  |
| --- | --- | --- | --- |
| **Ed Board** | | **Affiliation/Sphere** | **Term Ending** |
| **Co-Chair** | Mehran Sahami |  | Jun-18 |
| **Co-Chair** | Jane C Prey |  | Jun-18 |
| **Vice Chair** | Elizabeth K Hawthorne | CCECC | Jun-18 |
| **Past Chair** | Andrew McGettrick | ACM Europe | Jun-18 |
| **Members** | Valerie Barr | ACM-W | Jun-18 |
|  | Scott Buck | Intel | Jun-18 |
|  | Dan Grossman | SIGPLAN | Jun-18 |
|  | Alison Derbenwick Miller | Oracle | Jun-18 |
|  | Debra J. Richardson | CsEdWeek | Jun-18 |
|  | Chris Stephenson | Google | Jun-18 |
|  |  |  |  |
| **ACM HQ** | Yan Timanovsky |  | NA |
|  | Bobby Schnabel | ACM CEO | NA |
| **Ex-Officio** | Mark Nelson (CSTA Executive Director) | CSTA | NA |
|  | Renee Dopplick (ACM Director of Policy) | ACM Policy Office | NA |
|  |  |  |  |
| **Education Council** | |  |  |
| **Members** | Ginger Alford | SIGGRAPH rep | SIG appointed |
|  | Tracy Camp | CO School of Mines | Jun-18 |
|  | Michael Caspersen | ACM Europe | Jun-19 |
|  | Michelle Craig | SIGCSE | SIG appointed |
|  | Janice E. Cuny | NSF | NSF Rep |
|  | Andrea Danyluk | Williams College | Jun-19 |
|  | Steve Gordon | SIGHPC | SIG appointed |
|  | Mark Guzdial | GA Tech | Jun-17 |
|  | Chris Hundhausen | TOCE Editor | TOCE Rep |
|  | Lisa C. Kaczmarczyk | Consultant | Jun-17 |
|  | Paul Leidig/Jim Leone | CSAB rep | CSAB rep |
|  | Mirella M Moro | Brazil | Brazil Rep |
|  | Peter Norvig | Google | Jun-18 |
|  | Barbara Boucher Owens | SIGCAS | SIG appointed |
|  | Eric S. Roberts | Stanford | Jun-17 |
|  | Mihaela Sabin | SIGITE | SIG appointed |
|  | Deborah Seehorn | CSTA Volunteer Rep | CSTA appointed |
|  | Ben Shapiro | Univ of Colorado | Jun-18 |
|  | Cara Tang | CCECC Chair | CCECC rep |
|  | Jodi L. Tims/Stu Zweben | NDC Study | NDC Rep |
|  | Paul Tymann | RIT | Jun-18 |
|  | Gerrit Van der Veer | SIGCHI rep | SIG appointed |
|  | R. Venky | ACM India | ACM India Rep |
|  | Pat Yongpradit | Code.org | Code.org Rep |
|  | Ming Zhang | ACM China | ACM China Rep |
|  | Yan Timanovsky | Headquarters Liaison | NA |
|  |  |  |  |
| **Advisors** | Owen Astrachan | Duke Univ | AP CS Principles |
|  | Daniel D Garcia | UC Berkeley | AP CS Principles |
|  | Alison Clear | Eastern Instit of Tech - New Zealand | CC2020 |
|  | Richard J LeBlanc | Seattle Univ | SE2014 |
|  | John Impagliazzo | Retired | CE2016, IT2017 |
|  | Lillian N. Cassel | Villanova Univ | Data Sci curricula |
|  | Heikki Topi | Bentley Univ | AIS rep; IS & Data Sci curricula |