

ACM CCECC Activities

The global mission of the ACM CCECC is to serve and support community and technical college educators in all aspects of computing education. As a standing committee of the ACM Education Board, the Committee for Computing Education in Community Colleges (CCECC) focuses on curriculum guidelines for associate degree programs as well as facilitating networking and community building for this sector of computing educators. As the current chair of the CCECC I am excited to share information about the projects of the CCECC and how readers can make use of, or contribute to, these projects. I will discuss the available curriculum guidelines for associate degree programs, as well as two current projects: Bloom's verbs for computing, and an ACM interest group for community college/two-year program educators.

Curriculum Guidelines

The CCECC spends most of its efforts developing curriculum guidelines for associate-degree programs in the ACM-recognized computing disciplines, including Computer Science, Information Technology, and Cybersecurity. These guidelines are helpful for

- building new programs
- updating programs
- carrying out program reviews
- aligning with academic, professional, or industry standards

Each set of guidelines includes a competency framework with competencies and/or learning outcomes based on Bloom's Revised Taxonomy [4]. The use of

verbs associated with the six levels in the cognitive domain of Bloom's (Remembering, Understanding, Applying, Analyzing, Evaluating, Creating) allow competencies to be expressed with an indication of the

Confidentiality, Integrity, Availability, Risk, Adversarial Thinking, and Systems Thinking. The heart of the curricular framework is a small set of competencies for each domain, along with a variety of student

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Last year the CCECC published its two most recent curricular volumes, for Cybersecurity programs (Cyber2yr2020) [5,13] and for Information Technology Transfer programs (IT-Transfer2020) [6,14]. Cyber2yr2020 is based on CSEC2017 [9], ACM's guidelines for baccalaureate Cybersecurity programs, and maintains the eight domains found in CSEC2017: Data Security, Software Security, Component Security, Connection Security, System Security, Human Security, Organizational Security, and Societal Security. The domains are cross-cut by pervasive themes including

learning outcomes organized by subdomain. The curricular content aligns with the CAE-CD 2Y 2019 knowledge units (requirements of the NSA and DHS National Centers of Academic Excellence in Cyber Defense) [11], the ABET criteria for two-year Cybersecurity programs [1], as well as the NICE Cybersecurity Workforce Framework [10]. The full curricular guidelines and related documents such as mappings and program examples are freely available for download at the CCECC website [3].

IT-Transfer2020 is intended to offer guidance for transfer programs in the field of Information Technology (IT), and is based on IT2017 [15], ACM's curriculum guidelines for baccalaureate Information Technology (IT) programs. The number of IT programs at the bachelor's level has been increasing, and more colleges are considering transfer IT programs. IT-Trans-



fer2020 helps both two-year programs and their transfer institution partners with questions such as which content should be covered before and after IT students transfer.

In addition to Cyber2yr2020 and IT-Transfer2020, the CCECC has published guidelines for Computer Science Transfer programs (CSTransfer2017) [2] and applied, career-oriented IT programs

(IT2yr2014) [8]. Table 1 summarizes the ACM curriculum guidelines available for associate-level programs in computing disciplines. All are available in the ACM Digital Library or on the CCECC website [3].

To demonstrate the applicability of these curricular guidelines, the CCECC collects program examples that align the courses in a given program to the guidelines. If you would like to highlight your

program on the CCECC website as a program example, or to see existing program examples, visit [3] and select the Program Examples tab.

Bloom’s Verbs for Computing

As noted above, the CCECC uses Bloom’s Revised Taxonomy [4] when crafting competencies and learning outcomes, including a list of verbs associated with each level of cognition. To give a few examples, the following verbs are associated with Remembering, the lowest level of cognition: define, label, list, recognize. The following are some of the verbs associated with Applying (the middle level): calculate, diagram, illustrate, execute. The following are some of the verbs associated with Creating (the highest level): create, design,

Table 1: ACM curriculum guidelines for associate-level programs

Curriculum Guideline Short Name	Computing Discipline	Targeted Program Type	Year Published
Cyber2yr2020	Cybersecurity	Applied and Transfer	2020
IT-Transfer2020	Information Technology	Transfer	2020
CSTransfer2017	Computer Science	Transfer	2017
IT2yr2014	Information Technology	Applied	2014

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develop, formulate. The verbs are used to express the level of cognitive depth of a given competency or learning outcome. However, none of the verbs is specific to computing disciplines, and this sometimes requires a “work around” to express a computing-centric outcome with a non-computing verb.

One of the CCECC’s current projects is to develop a list of Bloom’s verbs appropriate for computing disciplines. In a first step, a candidate list of 85 verbs was generated, distributed across the six levels of cognition. The list included such candidates as comment, install, encrypt, deploy, configure, test, administer, code, refactor, and secure. This initial list was presented in a poster at SIGCSE 2021 [12], with feedback gathered during the session, as well as via a survey sent out on various channels and mailing lists. This feedback was used to further refine the list.

The CCECC is seeking additional input and feedback from the community on the latest draft of Bloom’s verbs for computing during Summer 2021. Check the CCECC website [3] for opportunities to view the candidate verbs and offer your input.

Community College / Two-Year Program Interest Group in ACM

Beyond its focus on curriculum, the CCECC also seeks to facilitate networking and community building among two-year program faculty and anyone with an interest in this sector of computing education. If you’ve been to a SIGCSE Symposium or SIGITE Conference, you may have seen the ACM CCECC in the exhibit area, or noted a Community College Reception on the

program. In addition to these in-person events, the CCECC website, social media presence, and mailing list work to create community and keep those interested up to date with news, events, and publications relevant for computing educators at community colleges, technical colleges, junior colleges, and similar institutions around the world.

The CCECC is currently helping to launch a group within ACM for those interested in computing education in two-year programs globally, such as those leading to associate degrees offered by community colleges in the United States. These programs include both applied programs leading to employment as well as transfer programs intended to lead into the second half of a four-year program that culminates in a bachelor’s degree. At a minimum, this group will offer forums for both asynchronous (such as a mailing list/listserv) and synchronous (such as webinars or online meetings) discussion, interaction, and presentations on issues of common interest. Watch the CCECC web site [3] for opportunities to participate in upcoming offerings, or email me if you are interested in contributing to the group’s formation and development.

The ACM CCECC has been serving computing education communities for 40+ years [7], and we look forward to continuing to *serve and support community and technical college educators in all aspects of computing education* for many more years to come. This column has offered a quick overview of the recent and current projects of the CCECC and I invite any interested readers to contact me for more information or how to get involved. ✨

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