Voice
csta

Classroom Tools

The Voice of K–12 Computer Science Education and its Educators

IN THE NEXT ISSUE OF THE *VOICE*

Advocacy

It Just Keeps Getting Better

Lissa Clayborn

2014 MARKED ANOTHER BANNER YEAR for CSTA's premier professional development event—the CSTA Annual Conference. A conference is much like a stage play; what the audience sees, we hope, is a stunning performance. As most know, the reality is that it wouldn't have happened without the months of preparation, planning, and hard work that preceded the show.

Behind the scenes, our conference planning committee (Dave Reed, Program Chair; Duncan Buell, Review Chair; Doug Peterson, Workshop Chair; J. Philip East, Kristen Fisher, Patrice Gans, Tammy Pirmann, and Dan Wheadon) set the stage by selecting a stellar lineup of presentations. They also expanded the number of professional development offerings adding an entire new strand of three-hour workshops, four additional one-hour sponsor spotlight sessions, and six twenty-minute mini-sessions.

This allowed our performing stars, the presenters, to do what they do best: germinate new ideas, expand skill sets, and inspire. Monday, the first day of this two-day performance, offered 12 workshops where attendees could choose to learn more about Greenfoot, Lego Mindstorms, Arduino, and CS Principles, just to name a few. The day's activities culminated in a trip to the Universal Technical Institute's beautiful new campus in Lisle, Illinois, where "theater goers" were treated to a tour of the facility, a CSTA 10th anniversary retrospective, and a lovely buffet.

Day two, Tuesday, continued with a fantastic lineup of sessions beginning with author and Professor of Learning Sciences at the University of Pennsylvania, Yasmin Kafai, as the opening keynote speaker. Yasmin shared her thoughts on K–12 programming—not just in the classroom, but how CS can connect to clubs and communities.

Tuesday's 20 one-hour sessions and six twenty-minute mini-sessions included insights into how to integrate the CSTA K–12 Standards, maximize public-private partnerships to better support CS education, gamify your APCS homework, and more.

Recognized at the conference were Dr. Todd Ullah as the winner of the inaugural Administrator Impact Award; Mayra Bachrach as Advocate of the Year; Betsy Frederick as Lifetime Conference Volunteer; and Chris Stephenson, former CSTA Executive Director, for over a decade of service, inspiration, and leadership to the organization and its 16,900 members.

Michael Kölling, lead developer of BlueJ and Greenfoot as well as Professor at the School of Computing at the University of Kent in the United Kingdom, closed the day and provided a brilliant finale to the lavish production.

The conference wrapped up with the CSTA Big Big Giveaway.

All of the conference sessions and keynotes for the CSTA Annual Conference are chosen through a proposal and review system. According to Conference Programming Chair Dave Reed, proposals this year included more high quality submissions than we had space for.

Executive Officers

Deborah Seehorn
Chair
deborah.seehorn@dpi.nc.gov

David Reed
Chair-elect
DaveReed@creighton.edu

Staff

Lissa Clayborn
Acting Executive Director
Phone: 1-212-626-0507
l.clayborn@csta-hq.org

Tiffany Nash
Events and Communications
Manager
t.nash@csta-hq.org

Pat Phillips
Editor
Phone: 1-608-436-3050
cstapubs@csta.acm.org

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If you missed this year's conference, you will be able to view some of the one-hour sessions in September on the conference microsite at *www.cstaconference.org*.

The 2015 CSTA Annual Conference will be in Grapevine (Dallas/Fort worth area), Texas, July 13 and 14. Don't miss out on seeing a new production with familiar and new stars. Interested in joining our cast of characters? Look for the call for conference proposals early this fall via the CSTA announcements listserv.

A special thank you to our sponsors for making the 2014 CSTA Annual Conference possible: Certiport, Microsoft, NCWIT, Oracle Academy, and Universal Technical Institute.

CS First Community Camps from Google

JamieSue Goodman

GOOGLE'S CS FIRST PROGRAM is supporting teachers and informal educators who are looking for exciting ways to engage more students in computer science (CS). CS First provides community volunteers (called "Gurus") and teachers with detailed club plans that include optional scripts to guide those unfamiliar with teaching or CS through the club experience. Resources include an online agenda timer to keep the club on track, instructional videos and daily reflection questions for students, and solution sheets to aid Gurus and hosts in using Scratch. CS First is an easy, low-commitment exposure to Scratch for teachers, so they can consider using Scratch in their classrooms. The curriculum is available at: *cs-first.com*.

CS First clubs have been led successfully by teachers, media specialists, and parent volunteers with no prior CS experience. As one teacher said, "Hosting a CS First class provided me with the opportunity to learn along with the students." More than 1,200 student alumni, 70 community volunteers, and 40 teacher hosts have participated in CS First since it launched in Berkeley County, South Carolina, last summer.

CS First clubs are organized around themes, such as fashion, music, and game design, to appeal to students' intrinsic motivations. Clubs typically meet twice a week after school for 60–75 minutes. Each theme runs for four weeks. Club themes can be scheduled back-to-back in a series so students can sign up for multiple camps.

CS First instructional content is delivered via videos. Each video focuses on a CS concept, describes how CS is used in multiple careers, and reinforces perseverance and a debugging mindset. Each day, students work on a short, daily core project which provides immediate success and a sense of accomplishment. After students complete the core project, they can customize it with add-ons. CS First also creates a social atmosphere by encouraging students to help each other, show their work, and showcase their projects.

Google created the free CS First program with two goals in mind: to engage students in CS at an earlier age, and to grow the number and diversity of students who sign up for CS courses in high school and college. Surveys show that 92% of CS First students report they would like to participate in another CS First club. 94% of CS First students would like to become "mini gurus" and help other students in future club events. Teachers who were nervous about their technology skills at the start of the club also showed growth in confidence and ability by the club's end.

The development of CS First began in summer 2013 with research being conducted by 14 teaching fellows with backgrounds in education or CS. The fellows taught students using several online CS tools, while surveys and observations identified which tool most engaged students. After four months of gathering feedback, CS First selected Scratch (*scratch.mit.edu*) as the primary tool for students in grades four through eight programs. After choosing Scratch, CS First tested content delivery methodologies with the aim of providing easily scalable content that doesn't require significant time commitment from potentially overloaded middle school teachers. After several iterations of testing, CS First decided to deliver content via short, instructional videos. One teacher host reported, "This is one of the most organized after-school programs that we have ever been a part of. There was no extra stress or work on the teachers hosting the program."

If you would like information about starting a free CS First club or to learn more visit: *cs-first.com/get-involved*.

Social and Computer Sciences

Partners in Teaching about Data

Lynette Hoelter

THE EASE OF INFORMATION SHARING via the Internet and the ability to be constantly connected to others around the globe means that we are encountering more and more data in our daily lives. The *AP Computer Science Principles Curriculum Framework* (draft, June 2014) points to the importance of teaching students to appreciate, analyze, and communicate about data of all kinds. Computer science (CS) teachers can get significant help accomplishing these goals from those who may seem unlikely partners—social scientists. Social scientists collect and analyze data, interpret and disseminate results, and ultimately share and archive data routinely in their work. They have also developed tools and resources that can help students learn how to think critically about data.

Big Idea 3, "Data and information facilitate the creation of knowledge," provides a natural entry point for using social science data. Each of the component Enduring Understandings could be addressed, at least in part, through the use of real data. For example, 3.1.1 focuses on the ways in which computers provide access to information and process data to gain insights and produce knowledge. The analysis of just about any social science data allows students and professionals make connections and put forth new hypotheses. Classroom exercises could range from demonstrating how professionals have analyzed data about a particular topic to having students do some analyses on their own.

Charts/graphs in popular media provide good talking points so that students begin to think about the data behind what is presented. Organizations such as the Pew Research Center and Gallup use survey results as the basis for interesting and accessible news stories that can be presented as examples of good communications about data. Interactive data visualizations and accompanying lesson plans, such as those found from Gapminder, provide another form of creating and communicating knowledge. On the flipside, the website "Just Plain Data Analysis" offers examples of

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Dave Reed
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charts gone wrong with explanations of why a particular graphic is a poor representation of the data. Students can easily use these sites to support item 3.1.3.

Giving students the opportunity to "play with data" helps them create new knowledge (3.1.1 and 3.2.2). Some websites have online interfaces that make it easy for students to create simple tables or graphical displays. *DataCounts!* for example, combines a simple interface with subsets of variables from the U.S. Census so students can explore relationships between various demographic characteristics. The U.S. Census' American FactFinder website enables users to view pre-made tables and to create tables for specific geographical locations, which could easily form the basis of an assignment that aligns with 3.2.2. *TeachingWithData.org* provides many more tools, assignments, and descriptions of websites.

Lastly, item 3.3.1 suggests that students learn that data may be archived for future use. A quick tour of some of the social science data archives gives students a perspective on how the same data might be organized, stored, and accessed by different organizations. Example archives include the Inter-university Consortium for Political and Social Research, the Odum Institute, and the Roper Center for Public Opinion Research. There are also international archives such as UK Data Service or the Consortium of European Social Science Data Archives.

While the use of social science data in teaching is a natural fit for Big Idea 3, there are other ways that it can help support the AP CS Principles curriculum. Enduring understanding 2.3 emphasizes the use of simulations and models in raising and answering questions. Social scientists use models for everything from epidemiological work tracking and understanding the spread of diseases, to predicting voting behavior, to explaining the effects of attitudes on behaviors relating to race relations or global warming. The results of such models are used in policy decisions, implementing and evaluating effective social programs, and more.

Additionally, Big Idea 7's focus on the global impact of computing is easily demonstrated using the case of social science data. Computing and the Internet allow avenues of information flow such that policy makers or journalists are a few keystrokes away. Administrative data, such as prison or arrest records for

> ## Computing and the Internet allow avenues of information flow such that policy makers or journalists are a few keystrokes away.

a particular locale, can be paired with demographic characteristics and compared to those of another area to identify patterns in causes and consequences of criminal activity.

Computing has also changed the "front end" of social science data. Cell phones and tablet computers make it easier to collect data about how individuals use their time, web surveys have become one of the main modes of data collection, specialized software permits psychologists to track and record cognitive processes through eye movements or activation of certain parts of the brain, and GPS allows field researchers to collect information about flora and fauna.

LEARN MORE:
CS Principles: *www.csprinciples.org*
Pew Research Center: *www.pewresearch.org*
Gallup: *www.gallup.com*
Social Science Data Analysis Network
    www.ssdan.net
American FactFinder: *factfinder2.census.gov*
GapMinder.org Lesson Plans:
    www.gapminder.org/for-teachers
Just Plain Data Analysis (bad charts):
    cas.illinoisstate.edu/jpda/charting_data/
    badcharts.shtml
ICPSR: *www.icpsr.umich.edu*
Odum Institute: *www.odum.unc.edu/odum/*
Roper Center: *www.ropercenter.uconn.edu*
UK Data Service: *ukdataservice.ac.uk*
CESSDA: *www.cessda.net*

Pulling Students up with Bootstrap—Literally

Marisa Brown

MANY OF OUR STUDENTS at Ralph J. Bunche Continuation High School in Oakland, CA, come from rough neighborhoods and difficult family situations. Many have gaps in their academic education that make school a struggle, especially with math. Traditional instruction does not work for many of our students, so we teach differently to make learning visual, hands-on, and engaging.

Ms. Vaughn, our math teacher, came to me one day very excited about Bootstrap (*www.bootstrapworld.org*), a program in which students learn to make video games and learn algebra along the way. Neither of us knew programming, so we had to depend on the well-written lessons on the website, including teacher notes for guidance and a teacher's manual with warm-up activities and homework assignments, as well assistance from the Bootstrap team.

Our students became very excited when we told them that they would be making video games—in spite of the fact than none had any previous experience with computer science (CS) and some did not even have an e-mail address! Many of our students were apprehensive about the math at first, but came to understand how math skills were critical for building their games. One student even accused us of tricking him into taking a math class. We admitted that, "Yes, this is math, but it's so much more."

Bootstrap is a curricular module for students ages 12–16, which teaches algebraic and geometric concepts through CS. At the end of the module, students have a completed workbook filled with word problems, notes and math challenges, as well as a videogame of their own design, which they can share with friends and family.

Unlike most CS classes, Bootstrap uses algebra as the vehicle for creating images and animations and is designed from the ground up to be aligned with Common Core standards for algebra. Bootstrap also builds in a pedagogical approach to solving word problems called the Design Recipe. Students solve word problems to make a rocket fly (linear equations), respond to keypresses (piecewise functions), or explode when it hits a meteor (distance formula).

It is exciting for students to try something new, feel success, and be proud of what they accomplish. Hearing students talking about their games and code is very exciting. Watching Ms. Vaughn break down math concepts in Bootstrap has even helped me to better teach my physics classes.

We have seen Bootstrap help students improve math skills, learn CS, and build their problem-solving confidence. One student, Alex, taught a lesson for new students who had entered the class and helped students catch up when needed. The Bootstrap mission is to use students' excitement and confidence around gaming to directly apply algebra to create something cool. It works!

Congratulations CSTA Member

The Computer Science Teachers Association (CSTA), in partnership with *Code.org*, is delighted to announce that the inaugural Administrator Impact Award winner is Dr. Todd Ullah. Dr. Ullah is currently the Administrator of Instruction for the Office of Curriculum, Instruction, and School Support, supporting STEM and Computer Science education in the Los Angeles Unified School District (LAUSD).

Ullah, a long time administrator in LAUSD, was nominated by Dr. Joanna Goode from the University of Oregon. In her nomination, Goode noted that: "Dr. Todd Ullah was the leading advocate within the Los Angeles Unified School District for bringing rigorous, college-preparatory, CS into the schools."

Learn more at: *csta.acm.org/About/sub/AdministratorImpactAward.html.*

Meet the Authors

Carlen Blackstone
Emmaus HS
Carlen has taught CS in Emmaus, PA, for 33 years. She is member of the Executive Committee for the American Computer Science League.

Marisa Brown
Ralph J. Bunche Continuation HS
Marisa is a science teacher in Oakland, CA. She enjoys learning programming and making her own video games with Bootstrap.

Lissa Clayborn
Acting Executive Director, CSTA
Lissa has worked for over 15 years in the nonprofit educational technology sector. Prior to CSTA, she was the Director of Operations at the ISTE.

JamieSue Goodman
Technical Program Manager, Google
JamieSue is thrilled to be back in SC, using her 15 years of software industry experience to launch CS initiatives.

Lynette Hoelter
University of Michigan
Lynette is the Director of Instructional Resources for ICPSR. She is an advocate of using social science data to build students' quantitative literacy skills.

Emily Kurze
Linux Professional Institute
Emily is passionate about supporting the global open source and Linux community at the LPI.

David Powell
Culver Academies
David has been teaching math and CS in Culver, IN, for 40 years. He also teaches CS to students from around the world during the Culver Summer School and Camps.

Angie Thorne
Hilliard, OH
Angie recently retired after 30 years of teaching high school math and CS. She is currently working as a mentor for educators participating in the Resident Educator program in South-Western City Schools.

A Favorite Lesson

Flying Tic Tac Toe

David Powell

Editor's Note: This is the first of a new series of *Voice* columns: A Favorite Lesson. Please submit your favorite activity using the format of this lesson for possible inclusion in a future issue of the *Voice* (*cstapubs@csta.acm.org*).

Lesson Overview
In this lesson, students create a program to simulate a Tic Tac Toe game. Two players compete to complete three in a row on a 3-by-3 grid. Each player starts with only four pieces—Xs or Os. The game begins like a typical game of Tic Tac Toe. Should either player complete a row the game ends. If not, the game continues as each player takes a turn moving a piece vertically or horizontally into the open square of the grid, trying to win with three in a row. There is now a second method for winning; moving a piece in such a way as to leave the opponent with no legal move. The assignment can be customized to add strategies and skills according to the students' abilities.

Grade, course level, or prior experience
Computer programming course after working with two-dimensional arrays.

Objectives
Work collaboratively to create a program employing structures and statements such as interacting classes, if-then-else, loops, and two-dimensional arrays.

Time allocation
One day for analyzing the problem and planning; several additional days for creating the program.

Materials and preparation
A programming environment to create the simulation.

Pedagogy Tip
Beginning with a "starter version" that uses a mouse click to choose and move a piece may be helpful in analyzing the algorithm and necessary code.

Lesson Steps
1. Describe the Flying Tic Tac Toe game.
2. Instruct students to create a paper version (a grid drawn on paper and four small shapes that can be placed and moved as the game progresses).
3. Observe as students play the paper version of the game to ensure they understand the rules completely.
4. Walk through the starter version and clearly indicate what section(s) needs to be modified for the first assignment.
5. Provide more guidance on creating a computer version of this game.
  • Describe the game play for version 1: One of the players is going to be the computer. For the first version, the computer will choose a legal move at random. The other player will be the user. The program should assume that the user will choose a legal move. Allow the user to decide that the game is over and who won.
  • Guide each student team to write an algorithm for a program in which the user plays against the computer. Depending upon students' skill levels, consider adding in other features to create a challenging assignment that offers opportunities for growth and success.

• Test algorithms: Instruct teams to join a second team to test the algorithms. One team attempts to play the game by carefully following the other team's algorithm. Problems should be discussed and ideas gathered for tweaking the plan. The second team then tries the first team's algorithm and similarly shares ideas.

Lesson differentiations and extensions
Several extensions can be used to create a project with challenges appropriate for the level of your students.
  • Keep a running score of several games.
  • Use grids of different sizes.
  • Create a version with a WinCheck class.
  • Write several interacting classes to manage the game and scoring.
  • Use various data structures.
  • Allow for mouse and/or keyboard input.

CSTA K–12 CS Standards
CL.3A-2. Work in a team to design and develop a software artifact.
CT.3A-3. Explain how sequence, selection, iteration, and recursion are building blocks of algorithms.
CT.3A-9. Discuss the value of abstraction to manage problem complexity.
CPP.3A-3. Use various debugging and testing methods to ensure program correctness.

Chapter Highlights

CS Rocks in Ohio

Angie Thorne

In the beginning, we were very lucky in Ohio because there was an annual three-day technology conference in Columbus that teachers, administrators, and technology specialists attended to learn about the latest and greatest educational technology innovations. If a person presented at least one session at the conference, then registration for the entire conference was free. What a great place to build a network of like-minded educators! Year after year, quite a few of the same people were presenters and the conference became the perfect place to recruit members for CSTA Ohio. Stephanie Hoeppner (Clermont Northeastern School District) and Angie Thorne (now retired from Hilliard City School District) had been selected to serve as CSTA Leadership Cohorts (now called CSALT) in 2008 and used the conference as a means to continue building relationships with other educators and finalize plans to form a CSTA chapter in Ohio.

The sixteen founding members elected officers, developed a plan, and applied to become a CSTA chapter in May of 2009. Shortly thereafter, the application was approved and CSTA Ohio was up and running. Since its inception two things are very apparent: educators want to recognize their students when they create quality work and they want to participate in meaningful professional development activities.

We would have three or more virtual meetings during each academic year and several items were always of concern: student recruitment and retention, exemplary projects, and course content and curricular issues. Over the past couple of years, course content has been a prevailing topic of discussion. We decided to host our own professional development. Just like in *Field of Dreams*, "build it and they will come!"

Our first attempt at dedicated computer science (CS) professional development was to work with conference representatives from the eTech Ohio Educational Technology Conference, where we received approval to dedicate one of the three conference days for CS projects and initiatives. Several CSTA members presented topics such as Scratch, robotics, CS Unplugged, curriculum overviews, and programming concepts. This format was quite successful and led to applying for, and ultimately receiving, a grant to host our own three-day CS workshop in the summer of 2012. This workshop was a huge success as registration was at full capacity and we had 100% attendance!

CSTA Ohio has received another grant for professional development. We will be hosting a one-day workshop in northern Ohio, another in central Ohio, and a third day in southern Ohio. For more information, visit: *www.cstaohio.com*.

In working toward our goal to engage students, Jay Shaffstall (founding post-secondary member from Muskingum University) along with Lisa Chambers (TECHCORPS) took the lead in creating a NCWIT Affiliate Ohio Chapter. This organization is a talent development pipeline that engages and recognizes young women interested in technology and computing. Learn more at: *www.aspirations.org/aspirations-community/ohio*.

We have been successful in our five years of CSTA Ohio but can be even more so if more people would get involved. We want to include you because CS really does Rock in Ohio!

Curriculum in Action

Doing Free Right: The CSE Asian Penguins

Emily Kurze

We all love free because it feels like winning. Perhaps that is the reason the Free and Open Source Software (FOSS) movement is rapidly growing across virtually every industry and is empowering students to impact their communities in very meaningful ways.

Recently I was fortunate to be introduced to the Asian Penguins, a computer club for students in grades six, seven, and eight at the Community School of Excellence in Saint Paul, Minnesota. Inspired by Tux, the penguin mascot of the free and open source operating system Linux, the Asian Penguins are the first Linux users' group to exist at a Hmong charter school. This group of more than 40 students gets together to learn the Ubuntu distribution of Linux, as well as other FOSS software such as LibreOffice.

But it's not just their technical skills that make these students so special; it's how they are applying their newfound knowledge to give back to their community. The Asian Penguins are helping families in need bridge the technology gap by providing them access to computers. The students call these trips into the community "missions." To carry out these missions, the students repurpose purchased or donated computers by loading them up with the Linux operating system and other free programs. Once the machine is ready to go, a team of students take the computer to a family who wouldn't otherwise have access to a computer at home. The students, each with a mission role such as photographer or translator, help set up the machines and teach the family members how to use the various installed programs.

During the past school year, the club was able to run eleven missions that provided computers to families. Faculty advisor Stuart Keroff shared, "These kids inspire me. In my professional career, this is the most rewarding thing I have ever done."

Keroff is setting his sights on getting the resources to expand the program next year and to begin networking with students at other area schools.

Our hope in sharing the Asian Penguins story is that it will serve as an inspiration to not only our Linux Professional Institute Academy community, but to schools everywhere. We hope to see more schools adopt programs that leverage the power of free and open source software, not only to give their students current technology skills, but also to make their communities stronger.

For more information about the Asian Penguins, to hear first-hand video reports from the students, or to learn how you can support their efforts, please visit: *www.asianpenguins.org*.

Student Opportunities

ACSL Competition Kickoff

Carlen Blackstone

ACSL (American Computer Science League) organizes CS contests for junior and senior high school students. This year, the 36th year of continuous operation, over 200 teams in the U.S., Canada, Europe, and Asia are participating. ACSL is on the approved activities list of the National Association of Secondary School Principals (NASSP). ACSL is also a CSTA Institutional Member.

ACSL organizes four regular-season contests that are held at each participating school. The last date on which each contest of the 2014–2015 season may be given is as follows:

CONTEST #1	**Friday, December 19, 2014**
CONTEST #2	**Friday, February 13, 2015**
CONTEST #3	**Friday, March 13, 2015**
CONTEST #4	**Friday, April 17, 2015**

At the end of the year, an All-Star Contest is held at a common site. Invitations to the All-Star Contest are based on cumulative team scores in the Junior, Intermediate, and Senior Divisions. This year's All-Star Contest will be held at Timber Creek HS, Orlando, Florida, on Saturday, May 23, 2015 (U.S. Memorial Day weekend).

Visit *www.acsl.org* to learn more about the contests and to register your school.

SHOW ME THE NUMBERS	
2014 CSTA ANNUAL CONFERENCE	
Attendees*	326
Workshop seats	386
Sessions	24
Workshops	12
Keynotes	2
Sponsors	5
Exhibitors	11
Desserts served	2608

*Attendance represents a 20% increase over 2013.

We're on the Web: *csta.acm.org*
Like our Facebook page!

Bits and Bytes

More Resources

CSEd Week
Mark your calendar for December 8–14, 2014. Start making plans now. Tap your students for ideas on how to reach students, parents, teachers, and your community. You will find resources at: *csta.acm.org/Advocacy_Outreach/sub/CSEdWeek. html* and *csedweek.org*.

Teaching about CS Careers
Don't miss the great posters, flyers, and other resources at: *csta.acm.org/Resources/sub/BrochuresPostersVideos.html*. Brochures make great handouts for parents at back-to-school events and for your counselors and administrators. Provide copies for the counselors to have on display in their offices.

Top 10 Reasons to Major in Computing
Help your students to begin thinking early about their education after high school. Learn about the careers and how to get there

from the people who really know—the professional members of ACM. Visit: *computingcareers.acm.org/?page_id=4*.

Equity Matters
Learn more about how to engage girls and other underrepresented students in computing at: *www.ncwit.org/ resources*.

Teaching Tips
Check out the wide variety of resources at: *www.teachingtips. com/blog/category/classroom-tips*.

Advocate Blog
Have you read the CSTA *Advocate Blog* recently? Hear what your colleagues are talking about in entries such as "You can be an Advocate" and "Do Your Students Still Surprise You?"—and then join the conversations at: *blog.acm.org/csta*.

MARK YOUR CALENDAR