Donna Thomas, Sherwood High School, Sandy Spring, MD
donna_thomas@mcpsmd.org
www.compscirocks.me

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HOW TO MAKE COMPUTER SCIENCE ROCK AT YOUR HIGH SCHOOL
Agenda

- Definition of Comp Sci
- Innovation in the Obama Age
- Why students should take your classes
- How to market your classes
- How to get “buy-in”
- How to validate your computer science program
- Becoming “awesomely cooler”
- Concluding Thoughts
What is Computer Science?

- “A discipline of constructing appropriate descriptive languages.” [Abelson & Sussman]
- ….consists of mechanics (computation, communication, coordination, automation and recollection), design principles (simplicity, performance, reliability, evolvability and security), and practices (programming, engineering systems, modeling and validation, innovating and applying) [Denning]
- “the study of computers and algorithmic processes including their principles, their hardware and software design, their applications and their impact on society.” [ACM Model Curriculum for K-12 Comp Sci]
What are current thought leaders are thinking?

- What do current thought leaders are thinking?
  - Is looking at the combination of human brain power and computers to solve problems that neither one alone can solve [Dr Luis von Ahn, CMU]
  - Interested in how computation can create powerful new forms of phantasmal media – interactive narratives, computer games, social media, AI-based art, and “new forms unanticipated by any of those.” [Dr Fox Harrell, MIT]
  - Has coined a term, “computational thinking” which “enables what one human being cannot do alone for solving problems, designing systems and understanding the power and limits and machine intelligence” [Dr Jeanette M Wing, CMU]
Computer Science is...

- Only kind of a science, only partially about computers (or programming)
- A combination of math, engineering, art, architecture, science and philosophy
- Understanding and solving problems in an abstract world, and connecting that to real world needs
My definition...

- The study of technological concepts* that when applied create tools for us to improve the quality of our life.

* the concepts include (but are not limited to) digital media, mobile computing, web, artificial intelligence, computational linguistics, neural networking, convergence of mainstream concepts and the innovation of new technological solutions.
Innovation in the Obama Age

- Barack Obama, 44th US President
  - 1st Technology President
    - 1st presidential candidate to run real social e-campaign (facebook, twitter, website, games, email)
      - for fundraising, volunteer management, persuasion, and community building.
    - Demonstrated focus on e-government initiatives
    - Understands the importance of technology
    - Uses data driven decision-making
      - based on data, evidence & rational analysis.
Top Ten Issues at Time of Election

- Manufacturing Decline (Automobiles, Electronics, etc.)
- Trade Deficit
- Budget Deficit / National Debt
- Infrastructure Deterioration
- Global Warming
- Environment Pollution
- Diabetes / Youth Obesity
- Health care inadequacy
- Natural Disasters (Hurricanes, Earthquakes, Tornado’s)
- Global Terrorism
Innovation

- Original invention with commercial and/or societal value.
- Recent Examples:
  - Surface Computers
  - Kinect console
  - YouTube, Twitter & Facebook
  - SmartPhones
  - Segways
  - Shigeru Miyamoto – Super Mario!
Why should your students sign up to take Computer Science classes?

- Current market analyses and trends (job outlook)
- Current college and university trends (preparation expectations)
- Intangible/tangible benefits for the student
Current market analyses and trends (job outlook)

![Annual STEM Job Openings vs College Graduates Through 2018](chart)


http://www.cccblog.org/2010/01/04/where-the-jobs-are/
University & College Trends

- Non-Computer Science majors are taking a programming class!
  - Typically waived, if taken in high school.
- Computer Science majors may have intro classes waived if students perform well in their HS comp sci classes.
- STEM-oriented programs are looking for their applicants to have had at least one computer science class...sometimes this can be the difference between being accepted and waitlisted.
- Many universities no longer require foreign language in HS
  - Drexel, Carnegie Mellon
Trends (continued)

- Computer Science is such a **big field** that there are sub-departments to focus on studies:
  - Example below is from CMU within the School of Computer Science:
    - Computer Science Department
    - Human-Interaction Institute
    - Institute for Software Research
    - Lane Center for Computational Biology
    - Language Technologies Institute
    - Machine Learning Department
    - Robotics Institute
    - Entertainment Technology Center
Benefits to Your Students

- Performance skills learned are transferable to other classes
- New friendships formed from peer-to-peer programming and collaboration
- High sense of achievement and satisfaction
- Achievements are rewarded
- Competitive advantage (college apps/co-ops) is gained
- Work is exhibited at local venues, and published
- Effort applied is making valuable contributions to society
- Industry leaders recognize efforts in achievements and give opportunities for experience.
How to “market” your classes

- Understanding Digital Natives (Your Students)
- Accept what is working and what is NOT, and be willing to take a risk
- Real life experiences* and examples of what can be done
- Key opportunities to “hook” potential students

* remember the **top ten issues at the time of the election**? Or look at the [UN Millennium Development Goals](https://unsdsn.un.org/millenniumgoals) or examine current events
Understanding the “Digital Natives”

- Gone are the days of priorities & time management – they are always “ON”
  - Cell phones
  - Online all the time
  - Social networkers
  - Play games
- Above all, they care about what their peers think
- Sleep deprived (always tired)
- Homework is out
- Living in a “green” world
Hooking Them...

- You need to spend time building relationships with parents and students
  - Write a personal letter about yourself and challenge the students to write back.
  - Introduction project – TELL ME
  - Create and maintain a website. [www.compscirocks.me]
  - Leverage online communication forums.
    - PTSA emailer, Edline, create your own.
  - Sponsor clubs.
  - Set up a daily routine that students can follow.
  - Set up a calendar of events and report on the results.

- Set up displays and have current students available to market their experience at key events
Key opportunities to “hook” potential students

- Back-to-School Night
- Course Fairs (rising 9th graders, and current population)
- Reach back to feeder schools
- Celebrations (Grace Hopper, CS ED Week, National Engineering Week, Intro Girls to Engineering Day, USA Science & Engineering Festival, etc.)
- PTSA, PTO newsletters, school paper, yearbook
- Connecting with technology companies in the area (field trips, visitors in class)
Clubs

- **Women-in-Technology**
  - Girls only...learn about technology professions, do projects. Teach “cool” things not being taught in regular class.
- **Computer Programming**
  - Computer programming competitions at local area colleges and universities..... rubik cube competitions ... computational linguistics olympiad.....CyberSecurity Challenge Team
- **Game**
  - Play and compete on consoles....make games.
- **Anime**
  - Japanese culture, cartoons, art, dance and sharing with visiting students from Japan.
- **Destination ImagiNation**
  - Creative problem-solvers
How to get “buy-in”?

- Hold an Open House (once a semester) and or [Virtual House](#)
  - Invite parents, potential students, counselors, teachers and administrators
- Hold a [Game Fest](#)
  - Invite in students, teachers, counselors and administrators to “play” and give feedback on the games under development.
- Solve “real world” problems
  - No bells during AP exams....hmmm..create a bell simulator that can be run off any computer.
  - No access to the school during the summer...create a [game](#) to help students find their way around the school without ever stepping on the school property.
  - Bullying is still a big problem...create a [game](#) to educate on how to prevent it in your school.
- Participate in curriculum development
- (students) Plan and host events at the school and county level
- Create web and desktop tools for counselors and administrators
- Deliver results
  - AP Test Scores higher than county, state and national levels
  - County test scores higher than county, state and national levels
- Participate in the [Partners in Learning community](#)
Activate Your Students...

- Hold art contests for website, t-shirts, decoration in the room or outside the school.
- Create a music [video](#) with your students or have them do one.
- Give and hold responsibility on the club officers to write proposals for fundraising, organizing, planning and hosting events.
- Challenge students to find [causes](#) that they can improve when working on projects.
- Encourage students to use multimedia tools to communicate with one another. i.e. [freecfere.com](http://freecfere.com); [github](https://github); [MS-OneNote](https://www.onenote.com)
- Inspire innovation by sharing [current events](#) and projects that you have completed on your own. i.e. [game](#) or [app](#)
- When there are problems in the school community that can be solved with computing, encourage your students to use the skills they are building to do so.
- Keep your students engaged by using peer-to-peer collaboration as often as you can.
- Play games to “test” on content. i.e. [jeopardy-GD.ppt](#) or check for vocabulary understanding by playing charades.
Validation of Computer Science at Your School

- Current legislation attempts...
  - Getting your student base and community actively involved in raising awareness and educational expectations
  - Did you know...
    - Rep. Jared Polis (D- CO) introduced a bill two sessions ago, HR 5929 to expand access to high-quality computer science education for all students?
    - Currently, it is dead on the floor.

- Resources from ACM, CSTA, IEEE, NCWIT, engineerGirl, SWE, Anita Borg Institute, etc. and county & state curriculum.

- Report, reflect and share the test scores of the students in your classes and also share their achievements outside the classroom in different venues!
Becoming “Awesomely Cooler”

- Attend CS4HS (CMU, UMD, MIT, etc)
- Attend Grace Hopper Celebration of Computing
- Attend technical training (many of which is listed on the APCOMPSCI listserv)
  - Activate at Carnegie Mellon is a good one.
- Find a Microsoft, Google and or Yahoo rep to give you access to their courses on how to:
  - Create an App for an intended platform, create software or a game, or learn an operating system.
- Encourage students (and may be participate yourself) to participate in contests like the ImagineCup & GGJ.
- Invite reps from tech companies to visit your classroom and discuss ongoing technology developments, and learn about new tools and hardware available for use OR do a field trip!!!
- Share your creations with your students, parents and the community.
- Consider advancing your education to keep your skills current.
To Dos for Next Year

- Find some relics or designs to include in the classroom
- Prepare your own website to promote your program, your classes and students’ successes
  - Seek students who love working with digital art, and web design to help.
- Plan out some activities that you can see through (get help from parents)
  - Check with feeder orgs or colleges/universities to see if there are opportunities to hook up and do activities
To Dos (continued)

- Read chapter 11 of *Born Digital: Understanding the First Generation of Digital Natives* by John Palfrey and Urs Gasser
  - Adopt some instructional strategies that will “connect” with your digital natives.

- Contact local area businesses for donations to incentivize students.

- Contact technology/game companies to arrange field trips and even possibly donate money towards the cost of the field trip.
  - *DigiGirlz Day*, Diversity Day, *special field trip* with your objectives defined
To Dos (continued)

- Design a unique project. If it requires investment, use donorschoose.org. IT WORKS!!!
  - Contact your tech company rep for access to free curriculum, software & hardware donations, and incentives.
  - Invite them to visit your classes.

- Become best friends with your yearbook and newspaper sponsors.

- Volunteer...volunteer....volunteer.
  - Promote your students’ skills....digitize an animation for a musical....write a program to simulate calling sticks from the rosters...ask the band director to have a concert strictly playing gamer music, and have your CompSci students create the animated backdrops and or dressup....have a community awareness seminar on CyberSecurity, CyberSafety and CyberEthics.
Concluding Thoughts...

- Be impassioned and show the love of your content and learning in all that you do.
- Become “connected” with the community and the emerging technologies.
- Infuse this into your content delivery to keep your students interested.
- Immerse yourself in networking opportunities like these, but also take some professional development opportunities to “spice” up your delivery.
- Empower your students to express themselves and take on challenges.
Concluding Thoughts (continued)

- Remember your students are digital natives, and if you are in the buzz, they are talking about you and promoting you to their friends.
  - PLEASE come up and see the tangible items on display that may inspire you.
  - Pick up the websites handout and bracelet on your way out.
  - PLEASE take the online survey and let me know how any of this has helped you and or will impact your students next year. *I am currently pursuing my National Board for Professional Teaching Standards certification and your input would be of significant importance in achieving this certification.*
Remember that...

COMP SCI ROCKS!

www.compscirocks.me

donna_thomas@mcpsmd.org

THANK YOU!

Any questions?