

# Building a Virtual Community of Practice

*A report from a working meeting in support of the CS10K Community*

*Stanford University, November 7-8, 2013*

Any opinions, findings, conclusions, or recommendations expressed in this Report are those of the authors and do not necessarily reflect the views of the authors' institutions or the NSF.

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Figure 1 NSF attendees

Thanks also to Adelaide Davis and Kathy Menchaca of Stanford for their help in the logistics of organizing and running this workshop.

## Executive Summary

Several NSF CE21 CS10k grant recipient teams convened as an overall working group focused on building and supporting a virtual community of practice. While we had many participants, we did not have many high school teachers present to provide feedback on the Virtual Community site, [www.cs10kcommunity.org](http://www.cs10kcommunity.org). The group in attendance provided the following recommendations to strengthen the usability and usage of the Virtual Community site and the building of an overall Virtual Community of Practice (VCoP).

- Enhancing the website by curating content, building templates to provide consistent formatting, and defining quality expectations for content posted and on-going moderation.
- Improving the content posted by obtaining input from high school teachers regarding content and website enhancements.
- Starting with the creation of local communities of practice via in person meetings, and then extending the local community to a virtual one.
- Extending the local virtual communities to a network and, from there, building a national network. It is hard to build a virtual community where teachers feel comfortable sharing and exposing what they need to learn or don't know without personal interaction. We need to provide connections both between these communities and to an overall national virtual community of practice. This would enhance both local and national efforts.
- Creating a toolkit for teachers to advocate for Exploring Computer Science and CS Principles to administrators, students, parents, and their community stakeholders.
- Building metrics to gather common data from the wide variety of activities occurring in the local, virtual, or actual CoPs.
- Continuing the conversations from this initial meeting– the entire group thought it essential to share ideas, resources, and best practices. A CoP or VCoP group of the grantees is needed to ensure it happens.

## Introduction

As part of the dissemination of efforts to build on and share current as well as developing scientific, technological, and pedagogical advances in teaching computing, a workshop was convened to explore online support for the CS10K project. The National Science Foundation (NSF) has funded multiple CS10K projects to provide professional development for teachers of Exploring Computer Science (CS) and CS Principles. According to Jan Cuny of NSF, the goal is to create 10,000 highly qualified high school CS teachers across the U.S.<sup>1</sup> Each project has a private, collaborative workspace at [www.cs10kcommunity.org](http://www.cs10kcommunity.org). Projects may choose to share some of the resources and discussions originated in these spaces with the larger CS10K community.

To further our goal of building a Virtual Community of Practice (VCoP) in support of these efforts, our meeting brought together more than forty key stakeholders encompassing academia, for-profit and non-profit players in industry, and participants from the NSF.

The workshop examined the rich existing landscape of research in cyber-enabled education and computing education, online communities of practice, and recent developments in introductory tools for teaching high school computer science. It was also informed by developments in online learning, such as massively open online courses (MOOCs) and the development of open platforms that herald new possibilities not just for issues of scale, but also for blended learning in localized settings.

The goal of this workshop was to share usage of the existing CS10K Community Website, propose short term improvements, and offer longer term suggestions for the development of a robust VCoP, which could include MOOCs, hybrid models, face to face events, and tools to be developed in support of the CS10K community.

While the concept of communities of practice is not new,<sup>2,3</sup> their use within computer science, while much more recent, still dates back nearly a decade. Fincher and Tenenberg discussed possible roles for a community of practice (they used the term "disciplinary commons") in higher education for computer science<sup>4,5</sup>. In particular, they created support structures to build a community to "document and share knowledge about student learning in Computer Science classrooms.... [And,] to establish practices for the scholarship of teaching by making it public, peer-reviewed, and amenable for future use and development by other educators."<sup>5</sup> Much of Ni's doctoral dissertation focused on creating successful communities of practice for high school computing teachers.<sup>6,7,8</sup> There is a wide collection of good materials available at <http://www.disciplinarycommons.org/><sup>9</sup>.

Trying to create a larger VCoP (where the goal is to connect individual communities of practice), however, is much newer. Certain desirable aspects of communities of practice, such as in-person meetings or in-person peer evaluations, are challenging to meaningfully accomplish in a virtual (i.e. not face to face) environment.

As part of its CE21 program, NSF made an intra-agency agreement with the Department of Education (award number #1256310) to create a website to support a VCoP across its CS10K awardees. Darren Cambridge, who has worked with creating VCoPs for Educause<sup>10</sup>, has been leading this effort. The challenge we addressed at this meeting is how best to connect each of the individual communities associated with CS10K awards into an overall VCoP. Our goal is to enable teachers both from these communities, as well as more broadly, to be able to share in the results of work by other groups.

During the workshop we covered:

- Shared experiences from a variety of programs that use online media and their advantages for K-12 computing education and teacher communities
- Current status and usage statistics of the CS10K Community website ([cs10kcommunity.org](http://cs10kcommunity.org))
- Recommendations for short term (6-12 months) directions for the website and overall Community

- of Practice (CoP)
- Future vision (next 5-10 years) for the use of online and technology based support in content and teacher professional development for CS Principles (CSP) and Exploring Computer Science (ECS) teachers.

Background on ECS courses and CS Principles:

Exploring Computer Science is supported by the *Broadening Participation in Computing* program of the Division of Computer and Network Systems of the National Science Foundation. From the <http://www.exploringcs.org/><sup>11</sup> site:

Our mission is to increase and enhance the computer science learning opportunities in the Los Angeles Unified School District (LAUSD), the second largest school district in the country, and to broaden the participation of African-American, Latino/a, and female students in learning computer science. To do so we have founded a K-12/university partnership, which is working on changes at multiple levels:

- Technical (curriculum, professional development, counselor education);
- Belief systems (stereotypes about what type of student can do computer science, low expectations);
- Political (policy changes that must occur to institutionalize computer science learning at the high school level, especially in schools with high numbers of students of color).

While we partner to deepen the capacity of LAUSD to support these reforms, we are developing a model and repositories of best practices that can help spread and inform similar efforts in other school districts.

Computer Science Principles is a new course under development that seeks to broaden participation in computing and computer science. <http://www.csprinciples.org/home/about-the-project><sup>12</sup>

Development is being led by a team of computer science educators organized by the College Board and the National Science Foundation. Pilots are ongoing at the high school and college levels. Advanced Placement credit is not currently offered for this course - present efforts in CS Principles are part of the requisite process to make it an AP course. The College Board Advanced Placement test for CSP will debut in May 2016 or later.

## Background

This workshop was the first time that many of the Principal Investigators and their teams had met with other CS10K grant awardees to discuss the Virtual Community of Practice. While all teams have been using the CS10K community website as part of their CoPs, there were variations in familiarity and intensity of use. The attached agenda (Appendix A) presents the structure of the workshop, which included panels of experts in community sites, online education, and CoPs, as well as breakout sessions.

## Presentations and Panels

### CS10K Online Community – Year 1 Summary

Darren Cambridge presented on the first year history for the CS10K community website. This site was developed and managed by American Institutes of Research. See Appendix B for his full report. Currently the site is not widely used. Teachers participating vary by project, with 60% of teachers registered at some sites, to a high of 100%. The total participation for all projects shows 89% of teachers have accessed the site after creation.

Usage data for the first year shows:

**5721** unique visitors

**662** total site members

**271** members are project teachers

Additional analysis shows:

**2194** total posts

- **296** posts by facilitators, (**13% of total**)
- **63** teachers posting
- **58** teachers posting more than three times
- **1.7** discussion posts/teacher

– Excludes posts to Forums (NMCS4All) and Piazza (ComPASS and BJC)

### **Panel on Communities of Practice**

Moderator: *Darren Cambridge* Panelists: *Neil Brown* (University of Kent), *Al Byers*, (National Science Teachers of America (NSTA)), *Irene Lee* (Santa Fe Institute).

Al Byers manages the online Learning Center for NSTA, <http://learningcenter.nsta.org/><sup>13</sup> and Neil Brown works on <http://community.computingschool.org.uk> at <http://www.computingschool.org.uk/><sup>14</sup>, a one year old site for CS educators in the UK. Al and Neil both presented information about online communities they have developed and managed for educators in similar communities of practice. Neil said part of their work is to engage university faculty in teaching high school educators. To avoid issues where teachers feel “condescended to” by faculty members, they try to provide teams that include master teachers.

Irene Lee discussed how her local community of practice is using the CS10K Community website, and what is useful for them. They have used some of the content to seed discussions on ethics and privacy issues. They consider the lesson plans a resource that can be modified and used by local groups. Irene would also like to see different models of teaching that could be shared, via video of classroom situations or other forms of tutorials.

Key factors for success were discussed – measured by usage, return visits, content posting, content downloads, and robust discussion forums. Both Al and Neil considered the following factors to be essential in creating a robust online community site:

- Moderation and Facilitation as well as incentives or rewards for those who do that work. Since this is a key factor for success, training of facilitators/moderators is funded at NSTA.
- Curation of content posted on the site. NSTA pays for this work to be done via funding from membership and grants. They solicited to fill these positions from educators who posted frequently and were considered providers of “high quality content” by the user community. 24 curators received training, and now meet monthly as a team, and additionally provide 74 hours of live chat during peak usage, and moderate asynchronous communication, and respond to questions posted. They serve as “concierge” for the communities to which they are assigned.
- Badges or other identification for those who post content
- The sending of regular email digests with enough detail to entice people to the resources available from the site
- In the case of NSTA, having funding to make peer reviewed articles free on the site
- Offline rewards for participation from NSTA – sending messages to districts when teachers are

particularly helpful to the online community. These sites support Communities of Practice which exist in addition to the sites themselves. There is always a tension between teachers wanting “just-in-time” answers to urgent questions via email to their CoP vs. participating in forums or discussions in an online site.

Local interaction and face to face time is important in building strong VCoP as teachers are more comfortable with people they know, and in the U.S., curriculum and practice vary extensively by local area. According to Al Byers’ experience, VCoPs that support local district initiatives are more successful when measured by participation, than broad ones but the broader VCoP is useful when experts are brought in to answer questions, do tutorials, and videos of best practices that are then shared locally.

The question of how many contributed content and quality concerns were addressed. Panelists emphasized that there is not a need for “yet another content repository”. However content that is about practice such as the following would be useful:

- Ideas to help seed discussions on ethics and privacy issues
- Videos of different models of teaching
- Resource packets that show content, teaching in situ, desired outcomes in terms of sample student work, and include templates that are easy to download and customize
- In courses where reflective writing is used, ideas for formative question probes and “how to” incorporate reflective writing in CS courses
- Personal self-assessment diagnostic tool, e.g., an index to learning needs used to create learning plan, and award badges, etc.

#### **Panel: Possibilities of future delivery of CS courseware content and professional development through online venues**

Moderator: *Shuchi Grover (Stanford)* Panelists: *Andreina Parisi-Arnon (Coursera)*, *Dan Clancy (Google)*, *Pamela Fox (Khan Academy)*

The panelists focused on the **future** possibilities of offering professional development and content for teachers of ECS and CS Principles through the prism of their organization’s experience.

All of these entities are moving toward hybrid models with online content, and online and in person learning communities. Best practices include personalized learning models, self-paced, mastery-based, and interactive techniques. While the traditional lecture model still exists, it’s not the goal to simply move this model to “the web”.

The panelists see the possibilities for online community for CS teachers, as these educators tend to be isolated and without a strong local VCoP. Their suggestions are to focus on the social piece of learning and building of social cohorts, not constrained to geography.

Activities could include:

- Creating teams for agile programming or pair programming online
- Peer review as another social form of learning
- Building environments that protect identity/safety for middle school
- Cultivating students to help them as peer tutors and/or potential Teacher Assistants

There is agreement among the panelists that hybrid models work better for most students, and it is not all or nothing. You also need to encourage in-person learning communities that include someone to answer questions, and potentially have a computer lab with real time facilitators, particularly in environments where students do not have 24/7 access to personal computers.

All agreed that for online professional development to succeed, content and how to teach it is not enough. You need to show how to interact with the platform, and be comfortable in the online environment from the beginning. If you simply put a course online, you will not get to completion - let alone mastery and willingness to teach new subject matter.

**Keynote: Karen Cator, CEO Digital Promise,**  
<http://www.digitalpromise.org/about-us/>

Karen Cator helped issue the first National Educational Technology Plan in March 2010. As a former director of education leadership and advocacy at Apple in Silicon Valley, Cator has been on the cutting edge of how technology can transform learning.

Per Karen, "Learning is at the center of the whole [national educational technology] plan. Technology allows us to create more engaging and compelling learning opportunities for students and allows us to personalize the learning experience."

Karen reviewed some of the successes she has seen to date, which include:

- Great personal and learning connections for those involved
- New partnerships developed
- All 300 high school teachers who have participated are now part of the VCoP

She also reviewed the challenges facing the project, and her recommendations on how to improve the VCoP. Given that the biggest challenge is supporting teachers who do not have a computer science background, but are willing to learn, there needs to be a lot of support for them as educators. She suggests the use of these tools to rapidly create the capability and capacity desired:

- Online publishing and sharing of resources
- Online networks – connections between people, networks
- Capability of personalizing the education for the user's (teachers) preference
- Tracking student performance – so much more information available about them
- Simulations and animations of complex concepts
- Allow for anonymous users as an inclusion tool
- Begin to curate a set of high dollar value badges as a reward for contributing content – focused on demonstrating something of value that has been peer or expert reviewed
- Think from the perspective of a teacher out, rather than the community in

**Keynote: Candace Thille, Ph.D. – Stanford University**  
<http://edf.stanford.edu/people/candace-thille>

Dr. Candace Thille is an Assistant Professor of Education at Stanford's Graduate School of Education and Senior Research Fellow for the Office of the Vice Provost for Online Learning. As the founding director of the Open Learning Initiative at Carnegie Mellon University, her research focuses on applying results from the learning sciences to the design, implementation, and evaluation of open web-based learning environments. In one of her many additional roles, she serves on the technical advisory committee for the Association of American Universities STEM initiative; and on the Global Executive Advisory board for Hewlett Packard's Catalyst Initiative. She served on a U.S. Department of Education working group, co-

authoring the “National Education Technology Plan,” and on the working group of the President’s Council of Advisors on Science and Technology that produced the “Engage to Excel” report for improving STEM education. Candace talked about the utility of simulations in creating powerful learning.

Candace is working on the “*Killer App*” to capture student learning data as it happens in the learning system. The goal is to create feedback loops to all system participants: students, instructors, and the course design teams.

Developing a feedback loop is as critical as the interactive learning environment, and their team is working on that in the OpenEdX v2.0. She decided to move to Stanford because while she is doing many of the same things, she is also able to include research on other aspects of the learning experience, such as social context, and stereotype threat at play.

Candace defines “Learning Engineering” changes in the 21<sup>st</sup> century as the following:

- Intuitive Design to Evidence Based Design
- Isolated Development to Connected Development
- Flying Blind to Data Driven
- Oversimplification to Managing Simplicity
- Strategy for Educational Improvement to Continuous Virtuous Cycle

## Break Out Sessions

Three breakout sessions were held over the two days to work within small groups on the questions of short term needs and desires for the CS10K Community, online and hybrid learning options for the Virtual Community of Practice, and longer term visions for the direction of this community. Additional topics within the breakout format were about the creation of a toolkit for communities that support the CS10K community, a discussion of mentorship by volunteers in industry and higher education, and the development of assessments/evaluations for traditional and non-traditional teaching models. While MOOC’s were discussed by panelists, when they were discussed in the breakout session, they weren’t suggested as a tool for building a VCoP in the near future. The possibility of hybrid learning models including tutorials for best practices, individualized learning assessment tools and other ideas were more widely discussed,

## Recommendations for Web Site Updates

The following is a summarized list of highest priority suggestions for changes to the website – multiple sessions repeated these same priorities. Notes for each individual breakout session are included as Appendix C. In each of the breakout sessions, the same concerns were raised, and the quality of content, privacy for teachers and students, and ease of use are of paramount concern.

Simplifying the complexity of the website was suggested multiple times, and suggestions to do so include:

- Changing the home page to provide better guidance based on user need
- Better search functionality – examples provided were of the Kayak travel site<sup>15</sup> with multiple filters
- Issues with menus - make resources more accessible to search and organized by topic
  - ECS pages within the community site are nicely organized and include lots of direction for

use; the same should be done for CSP pages. See <http://www.cs10kcommunity.org/ecs/> and <http://www.exploringcs.org/>

- Content suggestions:
  - Provide budget for curating contributed content – it is necessary to control quality, consistency, and to highlight best examples of specific topics
  - Individuals could also create “packets” from content which would include high level value-add, for example tutorials, and other related materials
  - Include high quality blogs by both leaders in the field and CS10K community members
- Provide both global and local access. People want to have their “local group” easily accessible but also want visibility into what other projects are doing: - may occur with improvements to site and as more content is uploaded.
- Provide recognition in both online and offline space for teachers who are contributing, such as badges and CEUs
- Digest issue – make email more informative and specific about the resources, have personalization choices of how you view/what you see/HTML email
- Use responsive web design to optimize for mobile users
- Provide simple tutorials for the complex features on site
- Address privacy issues based on role

### Recommendations for Growing the Virtual Community of Practice

Breakout sessions addressed ways to build and sustain a vibrant VCoP. Some of this is consolidated information from multiple small groups where there was suggestion repetition. Where topics differ, the key ones are listed below by section, and all content from the different breakout sessions is included in Appendix C. Overall, there is agreement that teachers will first connect within local groups, and create their virtual communities of practice there before being comfortable sharing within a larger national context. For a virtual community to flourish, relationships must grow from the local communities connecting among themselves, and then building connections to other local groups. Teacher input is essential to create VCoPs.

While the website can support a VCoP, multiple offline and face to face activities were suggested to make sure that initial efforts in building this are supported and sustained. Events similar to this conference were deemed essential for building and growing a virtual community of practice. There are many opportunities for extending the online community by meetings that would focus on these suggested topics:

- Assessment practices for hybrid courses, project based learning, reflective learning with posting of any templates and rubrics online at the community site to continue the work
- Opportunity to interact with industry where they can act as “expert teachers” instead of coming into the classroom where it’s not always a good fit, e.g., the TEALs<sup>16</sup> approach of having industry professionals act as a classroom teacher
- Work on mapping of ECS courses to state, CSTA<sup>17</sup>, and Next Generation Science Standards (NGSS)<sup>18</sup> along with the common core curriculum standards<sup>19</sup>– this helps teachers with content, but also with advocacy when it’s tied to larger goals
- Textbook or other curriculum evaluation which could be extended to the online environment

### *Website activities*

The website could support a monthly call for content that would support community building activities, not just content repository functions.

1. Teachers can create and vote on calls for content.
  - a. These calls for content might be around
    - i. CS Content
    - ii. Pedagogy
    - iii. Lessons
2. Teachers contribute content specific to the call.
3. Teachers rate and provide feedback on the submitted content.
4. Once feedback is provided, the best resources are highlighted.
5. Additionally small groups of teachers could work to refine some of the highlighted resources.

### *Possible topics for contributed content*

Not all topics will be relevant to all people, but we hope to engage teachers in collaborating around these.

- What prompts do you use for discussion with the book “Blown to Bits<sup>20</sup>”
- How to structure competitions/mini-app/hackathons in your classroom
- How do you integrate play into your classroom
- How do you support your students in being creative
- You have 2 minutes in an elevator with a student – how do you get them to enroll
- How do you teach X
- What board games and card games help you teach
- What kinesthetic learning activities do you use
- What could you do during CSEd Week, or an hour of code
- What kind of collaborative tasks could you give students (e.g. [Connected messages](#)<sup>21</sup>)

A possible professional development model is to create a blended face-to-face lesson refinement with the online content so that in-person professional development involves collaboration, and then extends to the online environment.

1. Within face-to-face PD
  - a. Teachers develop a lesson around a particular goal
  - b. All teachers receive feedback on their lesson
2. As follow-on work, either work with mentors, teams or pairs to continue this work in online format

### *Mentoring to grow the VCoP*

A mentor needs to be able to coach teachers through problems, counsel teachers, and be available for on-going 1:1 or 1:n for a few sessions. For teachers who are reluctant to share “embarrassing” questions or who don’t want a documented trail of their misunderstandings, there should be the capability of posting questions privately or having private “sessions”.

Common teacher questions include urgently needed content or “how do I teach this in my classroom setting?” Mentoring could potentially help if it was via online chat which could be anonymous and instantaneous. Examples given are tools available on the CodeHS.org site and the NSTA Help Desk.

Possible mentors include:

- IT professionals (~25,000) eager to be mentors as reported by Code.org
- Master teachers
- PD providers
- Undergraduates, graduate students

An in-person meeting to build trust between potential mentor and mentee is critical if using online tools. One method mentioned is to have a group of “mentees” work with a team of mentors who give instructions on process first.

Other referenced mentoring models:

Several different models were mentioned of programs that work. These include the:

- NSTA site,<sup>22</sup>
- the Math Science Partnership<sup>23</sup>
- Computer Research Association's Committee on the Status of Women in Computing Research (CRA-W), and their Distributed Research for Undergrads project<sup>24</sup>

### *Online Support for Cross-project Evaluation and Assessment*

CS10K sites should share some common features across projects. Each project report could share:

- Basic information about what is being implemented where, with what students.
- Student learning delineated by core demographics.
- Data on what courses exist including enrollment numbers, teacher numbers, and what professional development was completed.
- Evaluation results

The breakout group suggested that a report template should be created to use for all projects. While there are significant differences in each project, ideally some common data could be gathered and reported. It was suggested that teachers should maintain implementation logs, and have PIs use logs to track curriculum implementation by teachers in project. Some PI's are already providing teachers with sample assessments and other measurement/evaluation instruments.

It's important to create tools for validated instruments for CSP and ECS, particularly for student learning and validation within context. There is also a desire to see validated instruments measuring affective as well as cognitive development. SRI is in the process of developing tools to do this, and was represented at the meeting. See <http://pact.sri.com/><sup>25</sup> for more information.

If we are transitioning assessment, particularly of student learning, to an online platform, ideally a repository of assessments will be developed. (These would include language and tool-specific as well as conceptual ideas independent of language.)

### Teacher assessment

There is a need to connect implementation factors and adaptations to instructional strategies to student learning. These findings will also serve to build pedagogical content knowledge (PCK)<sup>26</sup> and other theory that can inform future professional development and pre-service teacher courses.

## *Toolkit*

A toolkit has been proposed to serve as an educational and marketing tool to highlight the need for the CS10K program and its related work. To be effective the toolkit needs to reach all of the constituencies involved in high school education decisions. This includes:

- Principals
- Curriculum Developers
- Guidance Counselors
- Parents
- Superintendents
- School Board members
- State Departments of Education
- State Policy Advisors
- Higher education including Community Colleges and Voc/Tech
- Industry and Non-Profits in this space

We want to ensure that the message is tailored by audience, and additional knowledge should be gathered to understand what matters to each audience.

Additionally equity issues must be addressed. Materials showing how to ensure inclusion of all students in both CSP and ECS courses are critical. NCWIT<sup>27</sup> and the Computer Science Teachers Association (CSTA)<sup>28</sup> have excellent materials for outreach to girls and underrepresented populations. In addition to creating the toolkit, we need to train teachers to be the advocates and distributors – to act as “champions” and use talking points to push for broader adoption of these courses.

## *Toolkit Contents*

We need to provide a series of FAQ’s, and many will appear in more than one list

Principals, Superintendents and Curriculum Developers:

- Cost
- Reputation/Image
- What is different than current “technology” courses
- Why should I choose ECS
- Why should I choose CSP
- How can my involvement in this leverage my relationships/partnerships with business, universities, and other organizations
- What do I need to do to get this done: staffing, computers, course approval
- What are the talking points for parents, school boards, businesses,
- Certification and accreditation in their state – provide specifics by state
- How to look to industry to obtain help and resources

Guidance Counselors:

- Create understanding that CS classes are an option for all students – quit discouraging or ignoring these courses

Information and Resources Currently Available:

- **NCWIT:** Aspirations in computing awards for girls and their teachers
- **CSTA:** ideas for programs and curricula
- **ACM:** programs that encourage individual study
- **Videos** of current ECS and CSP
- Sharing by students for other students about what they are doing in their ECS and CSP classes -- student projects

Interested Teachers:

- How to create great learning experience for my students
- How to get PD and other support to raise my confidence area in this subject area
- How to get students interested in courses
- What local resources are available

### *Toolkit Creation*

- Need a Project Coordinator who can design and then distribute the work to many people -
- Getting more people involved gives them ownership
- Tata Group or Code.org are possible funders

The toolkit will be tightly linked to the Community of Practice web site. Tata Group has agreed to house and develop the web page or a Wiki for the toolkit to allow people to have many ways to access the information.

### *Bringing New Research into the Virtual Community of Practice*

This was covered in one of the breakout sessions and was a discrete topic that didn't get included any of the above summaries.

- Best practices for high school and research to be shared – actionable and usable. Concrete examples for effective methodologies such as peer led team learning, pair learning, project based learning exist and should be disseminated.
- Share with a range of different education communities – counselors, administrators, make CS accessible and interesting to all
- Find a mechanism for departments and disciplines to share within and at the state policy and course requirements level – include Schools of Ed, CS Depts, Math Ed, etc
- Identify all audiences that are involved, and appropriate framing of research for specific audiences
- Do more foundational research – think like Math Ed people, not just tinkering with curricula.
  - Interdisciplinary research teams
  - Research around teaching PD
  - Study efficacy of CS professional development for HS teachers

## Workshop Wrap Up

Jan Cuny of NSF showed a video of former President Clinton talking about the Project Lead the Way program at a Clinton Global Initiative presentation<sup>29</sup>. She left conference participants with the charge to continue working on the questions raised by this workshop. There is a lot of enthusiasm to participate in updating this document to use as a working guide as efforts continue to build the Community of Practice for the existing and new CS10K participants.

## Conclusion

The work to create opportunities for all high school students to learn Computer Science is just beginning. It is essential to develop and deliver a sequence of courses that appeal to a broad range of learners, and not just the current students of high school AP computer science courses. Many organizations and individuals share this vision, and there was broad representation of these groups at this workshop, including National Science Foundation, Code.org, CSTA and higher education institutions.

This workshop identified a number of concerns to address moving forward:

*Involve high school teachers in the conversation and the development of all materials going forward.* Cooper, Grover and Simon discussed this workshop in their *Communications of the ACM* article to be published in May 2014:

*To change computer science education in K-12 in a fundamental way requires creating a community of practice that brings people together around focused interests and with the need for learning. Creating such a CoP is the means to the end of having an impact on practice. A Virtual CoP can create opportunities for teachers to connect and to check in with others, and opportunities for teachers to lurk and observe. Teachers want a place that provides real benefit to them. Creating a VCoP can help CS instruction find its place in K-12 education.<sup>30</sup>*

*Improve the VCoP by building and supporting local face to face communities.* Existing communities are likely to participate in larger activities such as online discussions. However, they need in person activities like professional development opportunities, local coaches, and mentors to create a community of practice that can be extended to a virtual space. Communities need more than a website to become a community – they are based on face to face relationships and must be nurtured in “real time” before they will succeed online.

*Create a toolkit to support local teachers and policy makers in “making the case” for Computer Science in high school.* A variety of materials are needed to address administration, students, parents and in some cases state legislators and departments of education. Key components must include information concerning ECS and CSP courses, and how these courses differ from technology and information literacy courses.

*Assess and measure both the effectiveness of the VCoP and student learning.* Tools are being created to do this by SRI, and others. More work on common measurement tools is needed to determine the effectiveness of the variety of professional development offerings for teachers, and student learning in K-12 CS courses.

*Continue to grow an active and involved community of education and computer science faculty, industry supporters and K-12 teachers.* The work to date has provided professional development and an online community for 300+ high school teachers. We need far more participants to reach 10,000 teachers actively teaching CSP and ECS courses as part of their regular offerings.

Thursday November 7, 2013

**MORNING SESSION, 8:15am-12pm. CS10KCommunity COP update.**

Update CS10K PI's and facilitators on the current status and stats of the CS10KCommunity COP and discussion of short-term future of the COP.

Morning Session, November 7, 2013	
8:15-9:00	Check-in and Breakfast
9:00-9:10	<b>Opening Remarks</b> <i>Steve Cooper (Stanford University)</i>
9:10-9:30	<b>Presentation</b> <i>Darren Cambridge (AIR)</i> Status and stats of CS10KCommunity
9:30-10:30	<b>Panel on Communities of Practice</b> Moderator: <i>Darren Cambridge</i> Panelists: <i>Neil Brown (University of Kent)</i> , <i>Al Byers (NSTA)</i> , <i>Irene Lee (Sante Fe Institute)</i> . Question for Panel Discussion: What are the best practices and lessons learned in growing a virtual COP for teachers of CS?
10:30-10:45	<b>Call to Action: <i>Jan Cuny (NSF)</i></b>
10:45-12:00	<b>Break out discussion</b> The short-term future needs and desires for CS10Kcommunity. Questions for this discussion will be determined and discussed in smaller break out groups.
12:00-1:00	<b>Lunch and Report Back</b>

**AFTERNOON SESSION: 1pm-7:30pm. Future possibilities of online support for CS K-12 teachers.** To envision the long term future of online support (MOOCs, COPs, and more) for content and professional development for CS Principles and ECS teachers.

1:00-1:40	<b>Talk</b> <i>Karen Cator (Digital Promise)</i>
1:40-2:40	<b>Panel: Possibilities of future delivery of CS courseware content and professional development through online venues</b> Moderator: <i>Shuchi Grover (Stanford)</i> Panelists: <i>Andreina Parisi-Arnon (Coursera)</i> , <i>Dan Clancy (Google)</i> , <i>Pamela Fox (Khan Academy)</i> Question for Panelists: What do you see as the <b>future</b> possibilities of offering professional development and content for teachers of ECS and CS Principles through the prism of your organization's experience?
2:40-2:50	<b>Coffee Break</b>

2:50-3:30	<b>Talk</b> <i>Candace Thille (Stanford University)</i>
3:30-4:45	<b>Facilitated working discussions</b> <i>Questions for discussion will be determined and could include (but not limited to) Discussions of how MOOCs and online courseware might, in the future, be leveraged to offer both content for CS K-12 teachers to use in classrooms and for professional development. The possible use of online courses to also extend the reach of CSPrinciples and ECS courses. What are the visions of what that could look like? What are the best practices for both online content delivery and pedagogy? Ideas might include using a MOOC-like structure to offer CSPrinciples or ECS content collaboratively (in a virtual COP), or to index and connect the various MOOCs and open online courses.</i>
4:45-5:30	<b>Report Back</b>
5:30-6:30	<b>Informal Networking Time</b>
6:30-7:30	<b>Graduate Student Flash Talks &amp; Working Dinner</b>

Friday November 8, 2013

MORNING SESSION, 9:30am-12:00pm A vision discussion

9:00-9:15	<b>Opening Remarks</b> <i>Jan Cuny (NSF)</i>
9:15-10:30	<b>Vision Discussion</b> <i>Facilitated working groups to envision future online support for CS K-12 teachers. Groups would be divided by topics of interest developed from previous day's discussions. Each group would develop a section of an outline vision statement of what the community would like to see in the future.</i>
10:30-10:45	<b>Coffee Break</b>
10:45-11:55	<b>Report Back &amp; Synthesis</b>
11:55-12:00	<b>Closing Remarks</b> <i>Steve Cooper (Stanford University)</i>

*Appendix B – CS10k Community Site Presentation*

## **What features in a CoP website would teachers want/need?**

### **Key takeaways:**

***NOTE: this is an unordered, bulleted list for a reason... not in any particular order:***

- bring teachers together at events like this to build community face to face
- home page changes:
  - at least make it possible for a login to be tied to ECS or CSP involvement.
  - ideally, make customizable for a given project
- simple, and usable website, from login to to usability. do less, not more
- encourage trust in local groups, but make it simple to push local to global
- involve teachers in the conversation a lot more to determine what's needed → including feedback from users of other CoPs to see how they interact with those.
- ongoing concerns with privacy (both in terms of functionality/usability and in terms of teacher understanding of what should be public and what sorts of things should start as
- universal search
- notification system that provides more useful information via email
- be able to respond to discussion threads via email
- make more welcoming
- customization:
  - flagging content to get back to later
  - browse/search through notifications through the CoP
  - meeting needs with personalized homepage

### **Brainstorming ideas:**

- Colleen Lewis (Harvey Mudd) suggests that it's probably not a great idea to implement every idea that is proposed.
- starting with teachers at the table-- what features do you want and what are your experience?
  - Nicole: modeling a good activity, what works well, what doesn't work well, hands-on resources. Generally, guidance on facilitating.
  - Don: simplifying the site (too many features now).
  - Gail: it's a site that's trying to serve the needs of a lot of different groups, that have really different needs. For example, the ECS folks have a lot of similar needs related to implementing the curriculum, but the CSP folks have different needs. across the board, people want need to be able to find their stuff.
    - Greg Russell builds on this, noting that the needs of the individual sites are really different. For example, those folks who are following a curriculum are looking for help with implementation, not resources.
  - Colleen: new teachers don't want to go to the site a see a bunch of stuff that doesn't make sense (can be intimidating).
  - Talking about implementation strategies vs. talking about resources that you may use in your classroom. Curriculum vs. Pedagogy. Then break down into specific strategies.
  - Make the homepage and the naming more straightforward. for example, from the home page make it clear

- Search needs to work. Contextual - I need to find what I want. Amazon and Google do that, and have raised stakes on people expecting search to work 'well' for them.
- Organization and structure
- Email notification needs to be improved, more personalized. Have been talking about it since January. If we can't get it to work, even harder for teachers. Maybe we need a how to video for us and them?
- You don't go to this website unless you get a notification. But people go to news sites, Facebook and others.
- Teachers are not able to have time to go to the CS10K site on a weekly basis, because of competing demands. Spread out too thinly. Share locally
- Video with synchronized searchable transcription, searchable, may be overkill
- Important to think about the local trust that's built in the local area-- hard to match that on a large scale. ← QUESTION: how does a group like NSTA deal with this?
- Sharing examples of good practices
- Short path to finding things (not million of steps). Usability
- Customizable homepage that facilitator can set up, but you can change what you see.
- Goal of the site is CS principles and
- Messaging issue: what is appropriate to share with the group, globally? By email or on the CoP? Private or public. Functionality of how to do it is an issue, but it's a harder conceptual decision to figure out whether something would be relevant and OK to share at the different levels
- Post anonymously, post from your email. Like using Basecamp to manage your project -- technology is there
- Long term sustainable plans for the facilitator roles
- Core complaint: Can't find what they want. So how can we make things easier. Filtering through the feedback. Implementing all the features different people suggest would be too challenging/make for a scattered overly complicated site.
- Have teachers vet the content. "Thumbs up to this lesson!"
- What about using Google moderator for this? It lets you 'float' useful resources to the top, flag submissions, and more
- Idea of collecting feedback is key
- Grouping ideas.
- What if you could get 'tastes' like with music? People that like things like what you've liked also liked...
- Watching a teacher see a lesson being taught. Teaches you how to engage the kids, how to explain things to the kids. If you're coming from language arts, how do you learn how to teach it, how to make it equal, how to not discriminate. Modeling for the teachers how to teach
- Don't say 'here's the best way' but get the audience to comment. "Here's how I'd tweak it, here's how I used it in my class..." Periodically make them contribute not just take: "Give us your best ideas on how to implement this lesson."
- Why isn't there a big fork on the main page differentiating between
- 'Effective' instead of 'best' practices.
- Allow people to lurk without logging in. If 90% are going to lurk, let them

- What does that get you? What if you're anonymous but have to log in, so that we can facilitate and track them.
- You can still track the IP, call them 'guest'
- Logging in can be a restriction. Why not put the content out there?
- NSTA: if you want to get, you need to give. Offer personalization of resources, space to make collections, need a login. Not a barrier because they're getting something for it
- It is a community, not just a barrier.
- Usability issue: incentive to log in. Maybe not everyone can see what you're looking at, maybe not get an email every time a discussion you follow has someone commenting,
- Now need to get email, and be logged in, and still not be able to find info you need
- Need to be able to flag things you find interesting/relevant. Now it's too clunky
- See all posts and collections made by a person. Only get notified if someone responds to that.
- Facilitate meetings of the teachers face to face. Let's bring three teachers from all our projects
- On Reddit they make local meet-ups. What about at the different conferences, pick a place to have a facilitated meet-up. Even if no one is paying people would really respond, and find it very interesting to meet with people you have been seeing online
- Seeing that people are meeting f2f would make others think about getting together
- Limit to Google hangouts of 15 people, then if they get kicked out they can follow on YouTube
- Cultivating leadership of the teachers
- Google summer of code has a mentor conference where all the open source mentors meet and are recognized for the work they do.
- Telling teachers "If you don't go to the CS10K site, I'm not going to get paid." It'd be great if they were to go on their own.
- Yes, the teachers were not going to the CS10K site to answer the questions/posts that people are posting. They'd rather post on the Google group and have someone respond immediately
- Managing a classroom skills transfer over to online for facilitators. Need to ask "Anybody else" so that it's not always the same person
- Right now the current model is to reward the know-it-all online: the more you dominate and monopolize the conversation, the more badges you get.
- How to encourage teachers to share their expertise without intimidating the teachers that are new/shy/insecure about their knowledge in this area
- Pairing up with a partner as a way to lure them into the website: how do we partner up to involve people that haven't had an easy time "belonging" perhaps because of intimidation by knowledgeable folks? or huge-hand-raising folks
- Not just 'LIKE' this post, but also have a way to say 'I found it unhelpful.'
- Private feedback would be illuminating for facilitators, doesn't have to be visible to everyone
- You don't want 1,000 people saying 'thumbs down' to your post.
- You don't get empowered by feeling small.

- Difference between “+1” on G+ and ‘LIKE’ on FB. ‘Like’ now just means ‘I saw this’ -- obviously I’m not happy your dog died. ‘+1’ just means I’m bringing attention to this post.
- How do we set the CoP culture to be inclusive rather than the cool kids club it is right now?
- What about collaborative posting, where people co-author posts. Don’t have to enter site on their own
- The high end teachers are the ones that are posting and judging and leaving/getting feedback. Not the struggling teachers that we don’t see on the site, the less confident teachers
- Assign partners to collaboratively develop something they share with their small group
- Need to focus on 1-2 things that we do well, and then expand test and iterate on other features. Otherwise lose focus and turn into blackboard

## How to get teachers to contribute?

What would motivate teachers to share & contribute?

Session Attendees:

Jeff Gray – Facilitator, Jennie Lyons – Scribe, Tom McKlin, Darren Cambridge, Dan Lewis, Joyce Malyn-Smith, Richard Hudson, Deepa Muralidhar, Aman Yadav

To summarize:

- 1) Recognition of teachers who are participating and PLUs / CEUs.
- 2) Incentive giving financial awards.
- 3) Twitter feeds as a means of communication
- 4) Feature student projects
- 5) More public events that give broader audience for teacher to interact.
- 6) Student competition
- 7) Regular consistent high quality blogs by leaders in the field and by members of the community providing real life experiences. (Brand new CS teacher talking about lessons learned.)

NOTES:

Problems for teachers:

- Teachers’ time is a problem
- Intimidation - Fear of vetting things, don’t know everybody, is my question to silly don’t want to say too much at first. Administrators will become aware of teaching practices.
- Benefit of contribution will come too late-and web site doesn’t facilitate good use for teachers because it will come too late
- Seeing Twitter emerging as resource - Should we be putting other type of social media into the mix
- Jeff seeing lots of chat texting during discussions on the side
- Need to onboard teachers and get them comfortable with it

- CoP is place teachers will come to get “community”
- Darren is seeing multiple channels are becoming more effective
- Joyce - seeing that participants more interested in what they do well and not what they do not need to know
- Topics chosen by project facilitators currently, and question is how to get teachers to contribute topics

During the summer facilitators were working more on face-to-face and just recently have moved to the on-line. Facilitator and number of teachers depends on project and also face-to-face is also dependent on project. On line would reduce number of face to face-to-face.

Need to be able to filter out the “noise” of the on-line portion.

Need to get people to contribute to the national on-line community. Local projects (Jeff) and more involved with each other and need to move to larger “community.”

Getting teachers to contribute in depth to one conversation might be a way of organizing it. (Dan)

Teaching takes place at different times for different teachers so good strong natural language search and good curation would be helpful for searching. Might look at tagging and way for facilitators to check back to tagging consistently.

Diversity of projects is a challenge - links are at a pretty high level of abstraction- get languages lined up with the content. Come when I have to teach a new topic tomorrow and I need lecture notes, assignments, lesson plans and notes.

Not only have the material but need to develop content knowledge as well. Getting teaching materials up, but not getting professional learning materials.

More focused topics are available on NSTA site

Looking at novice teachers coming and learning content what-how does algorithm work, then giving them materials after they understand the concept, one as learners of computer science and then other as learning to teach computer science. Looking at future looking at community of practice new people participating building confidence and then having the next dimension as teachers learn. Need to keep learning available as teacher progress.

Badges - seem to be working. Recognizing teachers at district and local level. Public acknowledgement of really cool things teachers are doing. Would that lead to more teachers joining? NSTA has made rewards more and more granular-not subtle things any more.

Badges more after the fact-not and if-the-else proposition. Teachers not really recognized within the profession. “Just want to be recognized.” Can we recognize good contributions? CS is not a check-mark for administrators. Teachers can distinguish themselves outside of the mainstream school. Is it permissible to celebrate a student accomplishment? Sharing of student work is important to see good examples. Showcasing good student work might be important. State-wide robotics will have special showcase; NCWIT aspirations in computing is a possibility. Can do a lot of “horn tooting.” Student projects will make a difference.

Hosted ECS schools to compete in 4 categories Alice, Robotics, Data Visualization and awarded plaques and certificates. Have asked to repeat it. Host contest on CS10K site. Set up challenge might develop interest.

Project group participation is limited, and although others can now get access.

Will this be in conflict with CSTA? CS110K community is people teaching these courses so other

organizations trying to support these teachers (outside of CS10K projects) will have chance for participation. Hoping to do things that are more public and open and funnel people into CS10K projects. Extending projects through new people and their participation and drawing the project participants out to larger audience.

Common problem is that teachers are very busy, but if it becomes their priority, how do we get them to make it a priority. Teachers are using other things like COMPASS, Google sites, and integration is not available so have to go to multiple sites.

Goal is to become go-to site for ECS and CS Principles. What about broader participation. Teachers need to have confidence in longevity to site.

If a teacher participates and posts, maybe facilitator needs to acknowledge and maybe get reward free trip to CSTA or \$\$ for classroom. Incentivize participants.

Pedagogical content knowledge: intrinsic motivations? How do I teach this? Nexus of pedagogy and content? This is how I deal with this information is available on the site. Novice teachers who are learning concepts are struggling with concepts that teachers are asking are also the questions that his students ask. Serving as a valuable resource-how to teachers address common misconceptions. Also, “how do I teach this?” How do we weave pedagogical knowledge into content? might be a place that could be available on the site. Where can I learn more about X? Where can I learn more about teaching X? So have the question of content knowledge and the question of pedagogy and having the teacher be comfortable answering student questions.

Great place to go for new nuggets. CS in the Wild interesting things that are maybe not tied to units. Needs to be easier to post to. Takes too long now and needs to be able to put new things up more quickly. May need to migrate to new software to handle these things.

Blogs-takes lots of dedication. Mark Guzdial. Alfred Thompson.

Twitter is kind of like micro blog. Some teachers are using it as their PLN. Could it be tied to PLU? There are some ways that you can get credit. Document more informal participation.

Site is structured to someone who understands CS. Someone who doesn't understand CS is not as comfortable. Site structure was done early on and may need to be restructured. Has morphed into something different from how it began. Every novice teacher will have different need. Site development is iterative.

Maybe site map would be helpful to get information on a specific topic. Can go to course and different units and drill down to sort through using different tags. We need to test if this is working. Just getting to point - critical mass - to do this.

Question about can we get feedback and there Is a tab for feedback. It is a nice mechanism to get feedback and maybe there is a need to revisit it.

## **Ideas for Curation of Resources and Materials**

### **Session Participants:**

Karen Brennan - Harvard (ScratchEd), Dan Garcia (facilitator) – Berkley, Nigamanth Sridhar - Cleveland State University, Nate Titterton – Berkley, Carl Lyman - Utah State Office of Ed, Sean Morris – Albany, Marie Bienkowski – SRI, Ralph Morelli - Trinity College, Trey Lathe – NSF, Chris Drew - Digital Promise

**Scratch Ed:** tag, scratched selects, bookmarked most.

Is the quality part of the community?

Is there a path to or curriculum for a teacher to find a set of lessons for a specific classroom?

Questions get ask in forum

What hasn't worked? Connecting local Scratch Ed teachers face to face didn't work really well.

How do you fill the needs of new teachers?

Connect with teachers in your community didn't work very well.

Where does the material come from? Teacher uploads. Some teachers are territorial. What about licensing? Creative Commons at Scratch created.

Community will bookmark things they like. Rubric to evaluate uploaded material to promote it.

Need to walk the fine line between recognition and reward

Can good materials be featured like on iTunes, MSN, etc.

Links to materials at site offsite. about ½.

What about dead links? People who check. Look for archive of good resources.

Comments and bookmarking to see popular or good materials.

Problems with resources for different versions of Scratch.

Uploading of material should require some simple minimum tags

Scratch Jr. is coming soon.

email notification of new posts to Scratch Ed. Curator adds meta data if needed.

Blessed Materials for those that work well.

Need to be able to upload a variant of the official curriculum.

**Knowledge tree like Khan Academy.**

**Prezi presentation with selected slides depending on the audience.**

Complicated questions to upload can discourage some uploaders. Teachers need the drilled down activities when they get started. Teacher can be rewarded in some way. Get paid?

Top down will be more formal. Pay facilitators. Connectors who make all the all the connections to the different parts in ECS and CS Principles.

Teacher need to be able to upload easily. Badging system in CoP or Leaderboard. Badge for others using. Badge for uploading. How to you recognize those who are doing a good job and not being showy.

NSF projects identify those doing a good job.

How do you report the using of others resources/tracks. Could you automate the top downloads? Send notification to local administrator or principal that their teacher is doing a good job on the site.

Like button on Scratch Ed is a way of showing their appreciation.

There is value in user generating new content that is not specific the curriculum. Letters to parents example.

Where do you get Badges? OBI

There are those who contribute a lot just by making good comments. Do you give levels/privileges to those who contribute.

How to you get people to give feedback on uploaded materials?

Should there be a template or required key aspects of a resource?

**Solution, adding content takes little curation, but have paid facilitators adding deeper curation**

Grouple badging system(?)

## Mentorship in the Community of Practice

Session Participants: Lien, Maureen, Irene, Sarah, James, Amit.

Summary:

- 1) What is mentorship?
- 2) What's the difference between a mentor and a facilitator?
- 3) What is the role of a mentor?
- 4) Do you pick a mentor or does the mentor choose you?
- 5) Issue of trust, privacy
- 6) How do we train mentors? or do we train the mentees.
- 7) How do we select / weed out mentors?

Jan mentioned that 25K industry professionals signed up on Code.org and are willing to serve as mentors. How to utilize them as a resource? what do they need to know? Where could we use them.

Potential solutions:

1. Chat / help desk
2. Mentoring in teams (different people filling different roles)  
Master teacher, computer scientist, "train" them together
3. Have a fun challenge
4. Setting up smaller ad-hoc groups for discussions.
5. Screening questionnaires
6. Ask the teachers how they would utilize 25K professionals?
7. On CS10K site include professionals in the community of practice.
8. Virtual matchmaking between teacher and mentor leading to a live interaction.

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What is mentorship?

Is mentorship different than facilitation?

Facilitator: conducts workshops, keeps discussion focused, synthesizes conversations, communication skills

Mentor: can be relied upon for assistance, has similar background to mentee, communication skills

cop facilitator: logistically and theoretically may not be able to serve as “mentor”; can respond to “just-in-time” questions and direct teachers to appropriate resources, can be one-off, 1 to MANY

cop mentor: may need to be classroom-based, needs to be able to coach teacher through problems, counsel a teacher, on-going, 1 to 1 (or a few)

master teacher?

MSP model - successful with frequent f-2-f mentoring

How to help teachers who are reluctant to share “embarrassing” questions, who don’t want a documented trail of their misunderstandings?

Teachers tend to call (not write) with these questions

Teachers are often reluctant to post these questions in a public place

Common teacher questions:

Some are content-based; teacher needs content info urgently

Some are “how do I teach this in my classroom setting?”

Facilitator hosted join me sessions for teachers; instead of joining join me, they called her on the phone

Online chat?...anonymous, instantaneous, eg Code HS or

Gchat?

Help desk (eg NSTA)

Some possible mentors:

\*IT professionals (~25,000) eager to be mentors... how to do this?

Possibly through a MOOC

\*Master teachers

\*PD providers

\*Undergraduates, graduate students?

Language programs as model?

\*Exchange (ie Japanese speaker teachers French speaker Japanese, vice versa)

\*Crowd-source translations

Where’s the fun?!

eg Iron Science Teacher (Exploratorium program)

How to message with administrators?

Perhaps start with a district?

In-person meeting with potential mentor and mentee is critical; need to build trust

“Team” mentoring model -- group of mentees will work with group of mentors

\*team gets instruction on how to best mentor

\*teachers get instruction on how to use the mentor team

\*district level

\*perhaps during district PD

\*heterogeneous team holds promise - diverse expertise, would allow mentees to choose most appropriate mentor

“Grow your own” mentor model -- teachers come up through the ranks and develop into mentors

Different levels of mentorship

-“buddy” level may be appropriate for undergraduates (content mentoring)

Teachers LOVE it; most students like it

“A mentor need not be a mentor for everything.”

-content mentor

-pedagogy mentor

Should cop do mentoring?

A venue to share local models of mentorship

Possibly a place to share contact info for eager mentors

CRA-W DREU program as model of mentor evaluation?

Jan will look into this

KEY TAKE-AWAYS:

-Mentorship and facilitation are different

-Teachers hesitant to post things they don’t understand

-Can CoP provide venue for anonymous discussion?

-CoP could facilitate mentorship IF preceded by f-2-f meeting and trust building

-Group mentoring as promising model

## *Appendix D - Meeting Notes Breakout Session 2*

### **Use of MOOCs/online courses for teacher PD**

Facilitator: Yasmin

Participants: Beth Simon, Briana Morrison, Dennis Brylow, Neil Brown, Richard Hudson, Trishan de Lanerolle, Carl Lyman, Ralph Morelli, Jeff Gray, Aman Yadav, Maureen Psaila-Dombrowski, Colleen Lewis, Sarah Miller

#### Action items:

1. BUILDING KNOWLEDGE Current online courses with smaller, not MOOC-sized groups
  - Lots of us trying to do the same thing...
  - Avoid reinventing the wheel
2. DEVELOPING PEDAGOGICAL CS CONTENT KNOWLEDGE (PCK)!
  - Use CoP to develop PCK
3. CREATING VIDEO RESOURCES Notion of teachers creating videos for other teachers
  - Use CoP to collect video lessons
4. LISTING common topics for which we need resources
5. CONNECTING how to stay in touch and how to share info with each other
  - Community on COP?
6. ASSESSING COMPLETION Certification
7. ALTERNATIVE PLATFORMS Don't forget about ebooks

#### Discussion:

MOOCs (or BOOCs) as platform for professional development of CS teachers...

What are desirable features/capacities?

Given that we're all working toward the same end, how many MOOCs do we need?

What is format/content of existing MOOCs?

-Video

-Access to reading materials

-Discussion forums

-Assessments

-# of times quizzes can be taken

New Mexico uses an online class; format =

*Teacher class:*

-30 teachers (all non-CS teachers) learned CS online

-online video (covering CS content and/or pedagogy)

- programming HW assignment graded by a person
- quizzes taken online, graded by computer

*HS student class:*

- flipped classroom
- dual credit (college and high school)
- video watched at home (8-9 minutes long)
- programming challenge - part of the in-class lab

Purdue:

- Teacher PD will be mostly online, just-in-time
- 1 week f2f, 2 hours online/week
- conducting student interviews re: misconceptions in CS0

Teachers need:

- content knowledge
- pedagogy knowledge
- PCK (pedagogical content knowledge)
- opportunity to “practice the practice” - observing in classrooms

OPEN of MOOC may be problematic...

- videos can't be posted online (particularly of students)

How to share resources and un-silo our projects?

Even though we are using different languages, we have lots in common: ethics, big data, cookies, security

What teachers want:

Teachers explaining content and lessons learned to other teachers

*Maybe these videos already exist? (youTube)*

This group could generate a list of topics and teachers could sign up

Seed with a few videos

Notion of cohorts

## **Specific Needs and Support for CSP Teaching**

Session Participants: Don, Owen, Joanna, Lucia, Gail, Sean, Brook, Jan, Nicole, Lien, Owen, James, Deepa, Eric, Kenton.

NOTE: the group has interpreted the prompt to be related to the community more broadly-- not just the online community

- let's think about differences in what the teachers need:
- Joanna: what about teachers who are teaching both?
- Gail: let's go back to something Darren said this morning-- the community is larger than the website.
- Way to identify what teachers need: proposal from this morning → bring teachers together at events like this to build community face to face and to talk directly to the teachers about what they need, what they're doing, etc. building relationships with teachers across districts/sites/locations.
  - several people in the group commented on the value of this from past experiences
- Synchronous events about things like assessment on the CS10k website.
  - look at examples Darren gave this morning (e.g., reflection and writing)
- How will assessments work in hybrid courses (or non-traditional), where they might be inquiry, or project-based, or ... and then a traditional assessment is given, e.g., in both ECS and CSP. How will students reflect on the work they've done?
  - could use the CoP to share ideas on assessment practices and strategies.
- look at/crowdsource good prompts and practices for reflective writing
- What are prompts AND practices for reflective writing -- even good prompts might not lead to good results if the practice of using the prompt isn't well-understood by the teacher
- How do you grade reflection? ← strategies, approaches, rubrics, etc.
- curate formative and summative assessments across big ideas Grading rubrics for many different activities
- Building relationships across groups: Utah and Delaware or Maryland or Alabama or all..
  - Is this in person? Is this online?
- Detailed formative and summative assessments for (CSP) big ideas
  - The assessments could be for a single big idea at the theoretical level
  - Could be across big ideas
  - Could be crossed with CT Practices
  - But, we need these for single big ideas to ensure it could be used across multiple approaches to CSP (ECS) ← these would need to be open ended and flexible, so students work might look really different across different sites but the theoretical and philosophical basis are consistent across uses of the assessment pieces.
- Examples of good assessments can also help you develop new assessments, so help teachers develop their own assessments by providing good models [replace assessment with other teaching needs, e.g., lesson plan]
  - design template/answer specific questions related to the purpose and goal of each part of the assessment.
  - provide discussion or scripting explaining why an assessment is good. Why does this assessment get at specific learning objectives?
- Make sure assessment is approachable for everyone.
- Identifying people with similar experiences/needs/background to talk to who can be a support in the process of assessment development

- Districts ask about textbooks. how do we address this question?
  - textbook could be replaced by an ECS-like teaching guide
  - not just about the bureaucracy, maybe it would be helpful for new teachers?
- College board informs publishers about changes in AP courses
  - What does this mean for CSP?
  - Advocate for teacher/instructor guide rather than textbook
  - What is a book?
- How can we get industry to interact with teachers to help rather than coming into a classroom and saying “here’s how we do things at company X”
  - Can we train/educate industry people?
  - Can teachers explain to industry people who to conduct learning experiences?
  - Industry people should come in to say “here’s something cool”, not an educator, but an advocate for excitement and information
- We need guided questions on CS10K so that when things are posted there’s a way of understanding things.

## Specific Needs and Support for ECS Teaching

- Many schools are missing a second computer course. Teachers address this by changing the ECS content (reduces fidelity) so that students can take the course a second time.
- Dealing with Geographical distribution - how can we best deal with this?
  - This is in relation to the summer, professional development workshops
  - Teachers are using ECS differently
  - Can do more to engage the community of teachers
  - To get ECS in under UCOP credit needs program status for ECS
    - To have this under state approval requires:
      - Professional Development
      - Fidelity of Implementation
    - Potential approach is to have statewide organization to keep tabs
    - SRI assessments might be a possible instrument to implement
- Helping with sustainability
- Bringing together community to leverage support for ECS statewide in order to get approval for university credit requirements
- Use existing expertise in addressing the politics of getting approval, perhaps using NGSS
- SRI did mappings between ECS to different state standards in California and Illinois.- Irene may have insights on this.
- Teaching teacher trainers
- CoP website targets teachers, but maybe should target administrators, counselors and parents. This can help these stakeholders gain traction with diverse students.

- Brochures and videos in order to recruit students (reference to code.org or University of Washington video)
  - Encourage students to make videos of their experience
- Resources for organizing competitions
- Recognition from CoP conferring completion
- Extending community of practice to grand parents
- Connecting ECS teachers with individuals at NASA/other organizations
- CoP as a way to review student designs
- Forums, etc. in order to help support teachers who may not be comfortable with the material
- Pairing teachers together
- Assessment (interpreting)
- Video on how inquiry should be taught
- Support inquiry based teaching and learning
- Curriculum
- Support for teaching on equity
- Content

## Synthesis

- Content
  - Urgent Help
  - Aligning curricular needs with school's expectations
  - Best Practices
- Pedagogy
  - Being successful in the classroom
  - Exemplar video
  - Separating Computer Science from Computer Scientists
- Assessment
  - Interpreting student performance
- Recognition
- Advocacy
  - State legitimacy
  - Recruiting
  - Parents and Grandparents
  - Networked improvement community
  - Bringing in the larger community of professions that use computer science
  - Linking back to common core

## Organizing structure for the Virtual Community of Practice

- **REMEMBER: the end user is the teacher, specifically the new one.**
- **Customizable experience** for each user, specifically on the home page.
  - the default home-page experience for teachers in a given project can be set by that facilitator, but the user can change from there
  - the default home-page for a teacher NOT in a given project is tied back to whichever course the teacher indicates interest in (that could be either or both) → ties to decision tree model below
- **Privacy**
  - issues related to knowing how/when to make something private ← specific issue with the ease of use/understanding where to go to make it private.
  - some functionality issues with making private posts on public content.
  - posting anonymously (still logged in, but have the ability to post without a name, this might require review before becoming visible)
- **Using outside tools in the CoP** → based on the tracking issues and what counts as activity on the site
  - adding support for responding to discussion threads from email (ala basecamp) and generally improving the notification systems.
  - using things like good forms, etc.
- **Presenting content**
  - separate materials based on what purpose they serve ← robust tagging
    - ECS, CSP
    - curriculum, teaching
    - etc...
  - “decision tree with decision support” for those who are starting to teach a course
    - include descriptions and important questions along with each of these steps
    - THIS could be the default home page for teachers who aren’t affiliated with specific projects.
  - view count (ala YouTube) → this could be held internally and used by facilitators to identify stuff that has high traffic and might be highlighted
  - look into something that looks more like a course structure (perhaps a LMS) as opposed to the resource sharing/discussion space we currently have → this is specifically noticeable for stuff like the resource book.
- **Following content**
  - support for following other teachers/projects to keep updates on what they are doing.
  - support for bookmarking resources, following discussions (without getting emails about updates, but just so mark it for later).
- **Public facing, non-log in, part of site that showcase awesome stuff that’s happening.**

## Online Support for Cross-project Evaluation and Assessment

Group: Jeff Forbes (NSF), Steve Cooper (Stanford), Joanna Goode (University of Oregon), Eric Snow (SRI International), Shuchi Grover (Stanford)

How do we evaluate whether it works when we have multiple projects, varying project objectives, multiple evaluators, multiple designs?

How to best share project evaluation designs, process, results?

- Common measures are essential
- What are some core measures that can be used across sites?
- Measure transfer
- Project reporting vs. evaluation reporting

CS10k sites should share common features across project evaluations

- Design
- Measures, including validity evidence
- Data

Each project reports/shares:

- Basic information about what is being implemented where, with what students, etc.
- Students learning delineated by core demographics. Going beyond the perceptions.
- Whether courses exist
- Enrollment
- # Teachers, # teachers who attended PD

How to get this data?

- One option is for PI to reach out to teachers in projects to ask for basic reporting of teacher and student data, some projects are already doing this
  - Teacher implementation logs, ask PIs to use logs to track implementation of curriculum by teachers in project
  - Providing teachers with sample assessments and other measurement/evaluation instruments

COP for project evaluators, discussion at CE21 meeting

- Design
- Measures
- Outcomes
- Data
- Who are the teachers?
- Learning outcomes?
- Instrument validation is important
- Need validated instruments for CSP and ECS, particularly for student learning
- Validation within context

Transitioning assessment, particularly of student learning, to online platform

Repository of assessments (language & tool-specific as well as conceptual ideas independent of language).

Teacher assessment

- How much CS knowledge do I need to implement ECS ?

- Fidelity
- Scope
- Sequence
- Gender equity practices
- Racial equity practices
- Background
- Attitude
- PCK
- PD impact (qualified, prepared)

Need to connect implementation factors and adaptations to instructional strategies to student learning and leverage findings to build knowledge about PCK and other theory that can inform things like teacher evaluation and possibly methods courses

## Collaboration-focused Website Needs

Session Participants: Sean Morris (Albany High, CA), James Atlas (Univ. of Delaware), Yasmin Kafai (Penn), Albert Byers (NSTA), Irene Lee (Univ. of Mexico), Ralph Morelli (Trinity College), Trey Lathe (NSF), Colleen Lewis (Harvey Mudd College).

- We should be able to create an ad hoc group, where small groups of people can collaborate effectively.
- **Tagging/Searching/Metadata**
  - We need **better searching**, enough to make autotagging irrelevant.
  - There may still be benefits to tagging. It might be worth having a curator.
  - It is **difficult** to get tagging right because people use very different language for the same content.
  - **Social curation** might also help people access valuable resources
  - **Data visualization** could be helpful in this process.
- We need mechanisms for **collaboration around curriculum modification**.
  - For example, BJC is using git-hub for modifying curriculum because people don't need to learn git to be able to use git-hub.
    - Contact Nate Titterton [nate@berkeley.edu](mailto:nate@berkeley.edu)

## Open questions

- How could we integrate other models of collaboration (e.g. Exquisit corpse)?

## Proposal 1: Monthly calls for content

### Summary of Proposal

We propose that the CoP site has a monthly call for content.

1. Teachers can create and vote on calls for content.
  - a. These calls for content might be around
    - i. CS Content
    - ii. Pedagogy

### iii. Lessons

2. Teachers contribute content specific to the call.
3. Teachers rate and provide feedback on the submitted content.
4. A facilitator curates popular resources.
5. Teachers after each call can access the curated resources.
6. Small groups of teachers may work to refine some of the curated resources.

## Possible topics

Goals - not all topics will be relevant to all people, but we hope to engage teachers in collaborating around these.

- What prompts do you use for discussion with the book “Blown to Bits”?
  - This might be a good cross-project topic.
- How to structure competitions/mini-app/hackathons in your classroom?
- How do you integrate play into your classroom?
- How do you support your students in being creative?
- You have 2 minutes in an elevator with a student – how do you get them to sign up?
- What fun stuff do you do in your class?
- How do you teach X?
- What board games and card games help you teach?
- What kinesthetic learning activities do you use?
- What could you do during CSEd Week? Or in hour of code?
- What kind of collaborative tasks could you give students? (e.g. Connected messages)
- What non-programming content do you use in your teaching?

## Proposal 2: Connect face-to-face lesson refinement with online lesson refinement

### Summary of Proposal

We propose that PD providers envision what type of collaboration would be beneficial to their teachers and model this type of collaboration in the face-to-face PD. For example, PD providers could facilitate lesson refinement.

1. Within face-to-face PD
  - a. Teachers develop a lesson around a particular goal
  - b. All teachers receive feedback on their lesson
2. PD providers encourage this type of lesson refinement in the online space.

## Toolkit – Purpose and Content

Motivation of need for a toolkit:

<http://www.youtube.com/watch?v=tkR1U3RGaJY>

Session Participants: Nigamanth Sridhar (Cleveland State), Kenton Machina (Illinois State), Joyce Malyn-Smith (EDC), Amit Jain (Boise State), Jan Cuny (NSF), Jan Plane (UMCP), Karen Brennan (Harvard), Dan Lewis (Santa Clara University)

Purpose of the toolkit - taking the constituents into account

- principal vs. teachers vs. school board vs. superintendent vs. policy/leadership vs. guidance vs. business and industry vs PTA
- each needs to be talked to differently

Big success getting things going when the industry (local industry) is pushing for it

If we have the all of these constituents we need to figure out what we want from each and that will help us figure out what type of content should be in the toolkit

Equity issues: two courses ECS and CSP - go after underrepresented groups .. to guidance: “here is an opportunity for you to get more girls into computer science”, the statistics about passing of the old AP exam is too geared toward a certain population and a certain demographic CS-A exam has given people a bad taste of what AP computer science is.

This message of why the ECS and the CSP is better than the CS-A.

We need to figure out what each constituency group cares about. If we figure out what they care about, we can get them to carry the message.

Developed a Scratch “starter kit” - 3,000 of them - figure out what the teachers need, embed your message: needed a great learning experience for their students, need help to build their own competency, and needed guidance on how to talk to their principals

We need to make sure teachers know how to be the instigators. We need to find a “champion” for this idea in each district/state.

Need briefing papers/talking points for each of the constituencies. Teacher needs to be convinced that it is a good thing for them to teach, Principals need to address what the teachers want and how to get it scheduled into their schools,

The structure of who to talk to in each school arrangement differs a lot depending on the structure of that

Look at it in a series of FAQ’s -- list for each -- many FAQs will appear in more than one list

### **Principal & Superintendents & Curriculum Developers:**

- Cost
- Reputation/Image
- What is different than current “technology” courses?
- Why should I choose ECS?
- Why should I choose CSP?
- How can my involvement in this leverage my relationships/partnerships with business, universities, other organizations I want to relate to?
- What do I need to do to get this done: staffing, resources (laptops), course approval?
- We need to convince the principal that it is more than preparing for a degree in computing - it is more a good thing for them to do in general (other side of that is why the keyboarding/computer usage does not prepare students correctly)
- What talking points of what the principal should say to parents, school boards, businesses, etc.

- Certification and accreditation in their state -- where to look to find what it is in your state (tell them where to look to get the information that are specific for their state)
- Might be able to get resources from business and industry -- need to make contacts with business leaders/organizations to get money for computers or robots or other ---- businesses often give away old computers

#### **Guidance:**

- Need to make sure they stop telling students computer science is not for them
- Need more students to be taking these classes - give them a chance to see if they like it

#### **Information:**

- **NCWIT:** Aspirations in computing awards for girls and their teachers
- **ACM:** programs that encourage individual study
- **Videos** of current ECS and CSP
- Sharing by students for other students about what they are doing in their ECS and CSP classes -- student projects

#### **Teachers:**

- How do I make this a great learning experience for my students?
  - videos of classroom practice
  - interviews with kids presenting their projects
- Where can I get the PD and other support to raise my confidence area in this subject area?
  - the curriculum - what is provided - what options - what is available “boxed”
  - print copy of the curriculum??
  - references to specifics for each of the topics (even if they are just examples)
  - then guidance on how they can find more about any topic they want
  - Is there “just in time” help available when I have an emergency - the “ask a librarian” model -- (we need to figure out how to staff this)
  - (It is more psychological than anything - that there are a lot of resources that they wouldn’t be alone)
- What can I get students to be interested in this area - if in a school where it hasn’t been an option.
- How might this course encourage students to have a bigger interest in math and other sciences? (students who take CS early do better on math standardized tests later in life - 98% of Google’s technical staff had their start in CS during High School)
- CSTA information & NCWIT

#### **How to get it done?**

- Coordinator but distribute the work to many people -- Getting more people involved gives them ownership
- Tata or Code.org are possible funders
- Dept or EHR are very limited (Office of Vocational and Adult Education) ECS is being accepted as a CTE program course - specifically Johann Uvin - strong advocate for STEM - maybe office of Technology Policy -- maybe even Dept of Labor

CTE -- better plan to have ECS and something else and CSP

Many colleges are teaching the CSP course, community colleges is a path we need to start marketing so that teachers can get what they need to take it back to the schools and also give students the chance to

make a more informed choice to take “technology track” or “computer science track”

Training kids to get an immediate job is one path - we want to make sure that student have a way to go

Community college - all students thinking of transferring into STEM should be “encouraged” to take CSP as part of the transfer.

\*\* Newsletter needed for this group -- report what has been done

California Community College Collaborative - MPICT

The toolkit will be tightly linked to the Community of Practice web site. Tata has agreed to house and develop the web page. A Wiki for the toolkit to allow people to have many way s to access the information.

## Current Online Site – What’s Working

Session Participants: Dan Garcia, Beth Simon, Jeff Sale, Greg Russell, Mehran Sahami, Briana Morrison, Florentia Spire, Sarah Miller, Neil Brand, Richard Hudson, Trishan de Lanerolle, Carl Lyman, Linda Bookey

Things we like:

- Events feature
- ECS pages
- Did great job of adding everything that was asked for
- Call this a beta so that people understand it’s a work in progress

Comments for improving the site

- Simplify the complexity of site
- ECS pages are really nicely organized – do same for CSP
- Simplify the Menus – combine people/groups/ - goal is to elevate the discussions to 1 click
- Content – more descriptions of what there is, better curation
- Facilitators do some high level value add – create whole packet using a template with CSP Essential Knowledge fields
- Visibility into what other projects are doing - may occur with improvements to site
- Issue with menu - make resources more accessible and organized by topic to search
- Digest issue – make email more informative and specific about the resources, have personalization choices of how you view/what you see/HTML email
- Curation is important, but requires significant resources
- Use responsive design
- A lot of this could be covered by adding a home page with better guidance

Search functionality – usability issue with Drupal, would like to see it be more useful like Kayak

Simple tutorials on site for some of the features

Control explosion of tags – curating piece needs to happen

Make sure that all groups post content

## Endnotes

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