

Work Smarter Not Harder Using Resources for K-12 Computing Education and Education Research

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ABSTRACT

While K-12 computing education is still in its infancy, the growth of computing education continues to rise. As this rises, so do the resources and tools for teaching and conducting research. In this special session, we present tools and resources created from educational theory to make teaching and scholarship easier and more effective. Included in these resources are the CS Teachers Association, CSforAll, CS Teaching Tips, the new CT Pathways Toolkit, EngageCSEdu, Edfinity, and CS Ed Research Resource Center. These tools and resources provide assistance at the district and school level (administrators, curriculum designers), classroom level (teachers), and researcher/evaluator level. In addition to the overview of resources, we will provide information on where to find and how to use them and will leave ample time for questions from attendees.

CCS CONCEPTS

• **Social and professional topics** → **Computing education; Computing education programs; Computer science education.**

KEYWORDS

Educational research, CSforAll, repository, evaluation, assessment, constructs, K-12, teaching tips, primary, secondary, resources

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1 OVERALL OBJECTIVE AND OUTLINE

As computing education continues to infiltrate primary and secondary schools, the number of resources for practitioners and researchers continues to grow. In this session, we will present seven resources specifically created for making practitioners and researchers jobs easier as they immerse themselves into new frontiers. After a brief introduction by the moderator, each presenter will be given 6 minutes for a pre-recorded presentation (40 min.). For the remaining 35 minutes, we will answer questions from attendees and may also ask attendees what resources they would like to see that are not provided, so we can better meet community needs.

1.1 CS Teachers Association (Baskin)

The Computer Science Teachers Association (CSTA) is a membership organization driven by local chapters that supports and promotes K-12 CS instruction [1]. CSTA provides opportunities for K-12 teachers and their students to better understand CS and to more successfully prepare themselves to teach and learn. The CSTA K-12 CS Standards, Revised 2017 (<https://csteachers.org/standards>) delineate a core set of learning outcomes designed to provide the foundation for a complete CS curriculum and its implementation. The CSTA Standards for CS Teachers, published in 2020, were designed to complement instructional goals for students and provide additional guidance for novice teachers, while also allowing experienced CS teachers room for professional growth. To support high quality professional development, CSTA is launching virtual communities organized by grade levels, courses, and topics of interest.

1.2 CSforAll (DeLyser)

CSforALL is a central resource for individuals and organizations interested in K-12 CS education in the U.S. [4]. CSforAll connects curriculum and program providers, schools and districts, funders, and researchers working towards the goal of providing quality CS education to every child in the U.S.. The CSforALL website,

www.csforall.org, has a searchable listing of all of its members and helps visitors identify curriculum, local programs, or research regarding CS education. The website is constantly growing, not only with new members, but also new features. In the panel, we will present the growing body of CSforALL resources available to school leaders and other practitioners working to establish equitable CS education for all students, including our new curriculum directory.

1.3 CT Pathways Toolkit (Burke)

The CT Pathways Toolkit is a new resource for districts to design and articulate system-wide learning in computing [2]. The project is based upon two years of intensive work with three unique schools: a college-town district seeking to increase participation among ELL students; a suburban district committed to improve achievement for students from low-income families; and a rural district focusing on increasing participation among girls. While each district's pathway varies, informed by their respective state standards and local initiatives, they are aligned by three principles: Consistency, Cumulativity, and Competency-Based (emphasizing discrete competencies per grade-band).

1.4 CS Teaching Tips (Lewis)

The CS Teaching Tips site (<http://csteachingtips.org/>) is a repository of over a thousand teaching tips for those teaching computing in primary, secondary, and post-secondary education. Tips are derived from best practices rooted in empirical evidence from research in computing education and interviews with over 150 CS educators. Teaching tips are categorized and searchable [6] and these brief, but important, tips are also shared on twitter (@CSTeachingTips). The site also provides quick-reference tip sheets and short videos with advice on reducing bias, lecturing, pair programming, and encouraging help-seeking. We recently added resources for leading scenario-based discussion games (<https://www.csteachingtips.org/cards>). This game has participants discuss how they would respond to overhearing statements like "women just don't like CS."

1.5 NCWIT's EngageCSEdu (Morrison)

The National Center for Women & Information Technology (NCWIT) developed EngageCSEdu [5] with Google due to the importance of introductory CS courses in attracting and keeping women in computing. This open-source collection of CS instructional materials for introductory-level courses contain submissions from university and high school teachers that undergo a peer-review process with CS and social science reviewers. Materials in the collection are required to use at least one evidence-based teaching practice that supports broadening participation, such as those in the NCWIT Engagement Practices Framework. The collection contains over 300 items and is easily searchable for finding the right project for your intro programming course or inspiration for a new assignment.

1.6 Edfinity (Grover)

Edfinity (edfinity.com) is a modern, NSF-supported online assessment platform focused on innovating and democratizing access to technology-enhanced assessments and facilitating teacher collaboration around assessment creation [3]. Assessments include a growing list of interactive assessment types such as sophisticated

drag-drop types (for parson's problems), hotspot and point-&-click items that raise engagement and reduce cognitive load, interactive coding items that can be autograded through unit tests, and auto-generation of randomized problem variants. Rich text editors for problem authoring allow for graphics, tables, and videos in problem stem or solution explanations. Other features include multiple attempts, hints and teacher dashboards. Our effort involves aggregating and curating a bank of items for formative assessment created in various curricula and research projects and organizing them into various taxonomies (state/CSTA standards, topics, grade).

1.7 CSEd Research Resource Center (McGill)

The CS Education Research Resource Center (<https://csedresearch.org>) has four major K-12 components: evaluation instruments, article summaries, research guides, and a new platform for administering surveys [7]. These free resources provide survey instrumentation for studying the impact of an intervention (e.g., self-efficacy, belongingness, computing interest) with evidence of reliability and validity and provides the ability for you to use these surveys in your studies off-the-shelf through the new survey platform. There are over 700 searchable article summaries and over 100 surveys that can be used to survey students, teachers, and administrators. Research guides provide additional guidance.

2 VIRTUAL SESSION, EXPECTATION, SUITED

This virtual session will have pre-recorded 6 minute videos from each presenter. The moderator will introduce each presenter and their videos, then will reintroduce the presenters and open the floor to questions. This leaves approximately 35 minutes to answer questions from attendees that are posted in a chat feature. Questions will be read by the moderator and answered by presenters. The intended audience for this special session are K-12 practitioners (e.g., teachers, curriculum designers, administrators) and researchers/evaluators. Given their varied content, these may also be of use to post-secondary faculty. Attendees will walk away with enough detail to consider their use in their work. This presentation is ideal for a special session. As K-12 computing education grows, getting useful resources in the hands of those that need it most will enable academic achievement of students while at the same time reducing stress among practitioners struggling to build pedagogical and CS content knowledge.

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