Resources for Researching and Teaching Computing Education in Primary and Secondary Schools: What Exists and What is Still Needed

Monica M. McGill (Moderator)
Knox College
Galesburg, IL, USA
mmmccgill@knox.com

Leigh Ann DeLyser
CSforAll Consortium
New York, NY, USA
leighann@csnyc.org

Miles Berry
University of Roehampton
London, England, UK
m.berry@roehampton.ac.uk

Briana Morrison
University of Nebraska at Omaha
Omaha, NE, USA
bbmorrison@unomaha.edu

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 SUMMARY

In this panel presentation, we will present an overview and discussion of several recent and complementary resources geared towards primary and secondary computing education. The moderator will present a brief introduction to the purpose of this panel and provide the format for the session. Each panelist will have 5 minutes to present the purpose of their resource followed by a demonstration of its content. Each panelist will share with the audience the resource, its content, its intended target demographic, and how it can be and has been used. Following the initial presentations, several minutes will be allotted for immediate questions and answers pertaining to the resource just presented.

Immediately after the presentation of all of the resources, the moderator will ask the panelists questions about future plans for each site in an effort to address resources still needed for the primary and secondary computing education community (including researchers). We will also engage with the audience to discuss these resources and discuss what types of resources are still needed to

improve the quality of primary and secondary education. Attendees will be encouraged to ask questions and provide suggestions for improving and enhancing the resources if they are currently using one or more of them.

The intended audience for this panel is anyone in the computing education community who may find these resources useful in their classroom or scholarship, particularly those researching, teaching, designing curriculum, or providing oversight of or input into primary and secondary school computing education. Given the varied nature of these resources, there is something for many different types of faculty scholars who may be attending ITiCSE.

By the end of the panel, the audience will have learned enough about these resources to begin to formulate ways in which they can use their content in their research, evaluation, teaching, or curriculum design initiatives.

1.1 cshedresearch.org (McGill)

The K-12 Computer Science Education Research (cshedresearch.org) resource contains a database of program element data derived from relevant peer-reviewed articles that report on K-12 computing activities and curriculum, evaluation instruments that can be used in computing education studies, and resources for conducting and reviewing research [5]. Targeted users for this resource are researchers, educators, and evaluators. Data has been curated from over 500 articles from ten ACM/IEEE venues and other journals and conference proceedings that focus on computing education or a closely related field for the years 2012-2018.

In addition, the evaluation instruments page includes a list of over 100 instruments searchable on such items as content knowledge, noncognitive factors (self-efficacy, interest, beliefs, etc.), year published, and more. The site also contains several resources for designing, as well as writing and reviewing articles on studies. Users can also submit their own articles and evaluation instruments for inclusion in the database. Although many articles are from studies conducted in the U.S., we welcome and encourage articles from other countries to make the set of data collected more robust. You can also follow cshedresearch.org on twitter (@cshedresearch), where posts related to cshedresearch are shared, including article summaries and evaluation instruments as they are added to the site.

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1.2 Project Quantum (Berry)

In the UK, Computing At School, working with Cambridge Assessment and Durham University's Centre for Evaluation and Monitoring, has crowd sourced over 9,000 multiple choice questions on computing for use by primary and secondary school teachers (see Project Quantum at <http://bit.ly/projectquantum>) [1]. The corpus of questions provides a shared interpretation of England's computing programmes of study, a way to drive lesson content, an easy way to check understanding within the lesson and a tool for summative assessment over a term or longer. The questions are freely available to all at <http://bit.ly/quantumquestions> and are released under a Creative Commons licence. Rasch analysis provides measures into the difficulty and quality of individual items, and responses to items provide some insights into progression within computing and common misconceptions.

1.3 CSforAll (DeLyser)

CSforALL is a central resource for individuals and organizations interested in K-12 computer science education in the United States [2]. The organization connects curriculum and program providers, schools and districts, funders, and researchers working towards the goal of providing quality computer science education to every child in the United States. CSforALL maintains a website, www.csforall.org, with a listing of all of its members that is searchable and filterable, helping website visitors identify curriculum, local programs, or research regarding CS education.

The CSforALL website is constantly growing, not only with new members, but also new features. In the panel, Dr. DeLyser will present the current state of the member page, and discuss planned expansions and thier implications for the CS Education research community. CSforALL also is the co-principal investigator in the RPPforCS project, a National Science Foundation funded project that is committed to providing a connected community of practice for research practice partnerships exploring K-12 CS in the US. The project currently has over 50 member projects featured on the site and is producing resources for the larger community about RPPs and CS Education research in general.

1.4 NCWIT's EngageCSEdu (Morrison)

The National Center for Women & Information Technology (NCWIT) developed EngageCSEdu with Google because both organizations recognize the importance of introductory undergraduate courses in attracting and keeping women in computing [3]. Research suggests that having high quality assignments, projects, and labs that are meaningful and relevant to a student's life, building inclusive student community, and providing high quality student support can increase the recruitment and retention of women in our field. One outcome of the initial project was the NCWIT Engagement Practices Framework that consists of research-based teaching practices for broadening participation in computing through excellent pedagogy and curriculum.

The other outcome was the EngageCSEdu (<http://www.engagecsedu.org>) website that is a living, open-source collection of computer science instructional materials submitted by and designed

for use by high school teachers and instructors of introductory-level college courses. All instructional materials submitted to EngageCSEdu undergo a peer-review process like an academic journal with both computer science and social science reviewers. In addition, all materials in the collection make use of at least one NCWIT Engagement Practice. Currently, the collection contains over 800 items and is highly searchable and well integrated with the Engagement Practices Framework. Since launch, EngageCSEdu has had over a quarter million pageviews and has hosted over 66,000 sessions. About twenty percent of the registered users are high school teachers.

1.5 CS Teaching Tips (DeLyser)

The CS Teaching Tips site (<http://csteachingtips.org/>) is a repository of over 1,300 teaching tips for those teaching computing in primary, secondary, and post-secondary education. These 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 [4] and these brief, but important, tips are also shared on twitter (@CSTeachingTips). The site also provides quick-reference 1-page tip sheets and short videos with advice for topics such as lecturing, pair programming, encouraging students to seek help, and reducing bias.

2 AUDIENCE

The intended audience for this special session is anyone in the computing community who would find these resources useful in their classroom or in their scholarship. Given the varied nature of the content of these repositories, there is something for many different types of faculty scholars presented here. At the end of the session, we hope that the audience has learned enough about these repositories to begin to formulate ways in which they can use the content of these repositories in their scholarship or teaching.

3 ACKNOWLEDGEMENTS

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