Meeting the Needs of All Learners through High Quality K-12 Computing Education Research

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Meeting the Needs of *All* Learners through High Quality K-12 Computing Education Research

Monica M. McGill (Moderator)
CSEdResearch.org
Peoria, Illinois, USA
monica@csedresearch.org

Leigh Ann DeLyser
CSforALL
New York City, NY, USA
leighann@csforall.org

Ismaila Temitayo Sanusi
University of Eastern Finland
Joensuu, Finland
ismaila.sanusi@uef.fi

Selina Marianna Shah
Amrita Vishwa Vidyapeetham
Kollam, Kerala, India
amiddids20003@am.students.amrita.edu

ABSTRACT

In this panel, we will engage in a discussion of how to conduct research (including choosing areas of focus) that benefits all learners who are learning computer science. We will bring together leaders in CS education and CS education research to discuss how CS education research is emerging in its definition of quality. This includes multi-national approaches for disaggregating outcome data to understand outcomes from youth of different gender, socioeconomic status, race/ethnicity, accessibility needs, and geographic location.

CCS CONCEPTS

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

KEYWORDS

Computer science education research, computing education, research, equity, high quality, evidence, standards

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1 SUMMARY

Policy makers, funders, and stakeholders are recognizing computing as a fundamental literacy for all youth, as well as a starting point for a robust workforce pathway. In the digital world, all countries need to ensure access to and participation in computing education is available to all learners in order to build strong citizenry and a technologically capable workforce to participate in the global economy. Across the world, researchers and policymakers are questioning whether our attempts to educate youth in the fundamentals of computing is yielding desired outcomes. Those outcomes can include all cognitive and non-cognitive outcomes, such as student knowledge in computing as well as interest in continuing to pursue computing or related studies after secondary school.

The education research to describe, measure, and assess these efforts is as new as the field of computer science, and the interdisciplinary nature requires integration of methods and standards not only across countries, but also disciplines – integrating computer science, learning sciences, psychology and others. In this panel we will bring together leaders in CS education and CS education research to discuss how CS education research is emerging in its definition of quality, including multi-national approaches for disaggregating outcome data to understand outcomes from youth of different gender, socioeconomic status, race/ethnicity, accessibility needs, and geographic location.

2 PANEL STRUCTURE

Each panelist will have four minutes to introduce their positions and perspectives. This will include how their own experiences inform their computing education research and practice. After each panelist has presented, the moderator will pose prepared questions to the panelists while also fielding questions from attendees in a shared document and/or via chat. Questions may include:

- What does research that takes into consideration various populations and cultures entail in a global community?
- How can high-quality and research that considers the needs of various students co-exist?
- How do evidence standards from countries across the world consider equity?
- What advice do you have for novice and experienced education researchers who want to produce high-quality research that also embeds an equity or CS for all students mindset?

In addition to these questions, we will use a QR code and a Google document for attendees to ensure that *all* attendees have the opportunity to provide feedback and pose questions. We will take questions directly from the audience and/or those submitted through the Google document.

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3 PANELISTS

3.1 Monica McGill (Moderator)

In addition to being formally trained in qualitative, quantitative and mixed methods education research, I have had the unique experience of reviewing thousands of abstracts and overseeing curation of data from over a thousand K-12 CS education research articles across a variety of topics, interventions, and design methodologies. I will share my experiences of seeing gaps in research standards and reporting as well as the harms these gaps can cause, particularly when diversity, equity and inclusion are not considered during the research design, implementation and reporting. I will also draw upon my past studies and exploration of evidence in data–my curiosity in how these gaps are being mitigated in other fields has led me to consider how these practices could enable a higher quality body of evidence across CS education research [3, 4]. I will also touch on what shapes our attention in research studies and how that process may be flawed, why it may be flawed, and how we may be able to contribute to mitigating the risks of subjective research design and interpretation of data.

3.2 Leigh Ann DeLyser

My career in computer science education started with 10 years as a secondary school teacher of math and computer science. Over my career I have earned two masters degrees - one in education and one in computer science. My PhD in Computer Science Education from Carnegie Mellon University was supported by the US Department of Education pre-doctoral fellowship, and involved rigorous training in the methods of education research, computer science research, and learning sciences. In addition to my own research on CS education, I have also helped lead multiple projects to support communities of researchers [2] and landscape and measure CS education research efforts (cite building capacity). In this panel I will represent both the need to elevate teacher voices, and the needs of researchers to understand, navigate, conduct research, and ultimately publish in this constantly emerging and changing field.

3.3 Ismaila Sanusi

As a researcher in K-12 CS education, I have had experience studying teachers' and students' development of computing concepts (e.g., Artificial Intelligence and Machine Learning) and integration of these concepts in classrooms. Prior to that, I started my career as a secondary school science (including computer science) teacher and worked as a researcher in a center for rural affairs and community development. While I consider various contexts in my research, my works in recent times have largely focused on K-12 computing education in Africa. On a global map of contributions to computing education research, Africa is greatly underrepresented [1], and as such, discussion regarding diversity, equity, and inclusion in research design and publications is almost non-existent. Drawing on my prior works [5, 6] and probing existing data, I will share my experiences of how considering these gaps and factors could contribute to quality research in CS education.

3.4 Selina Shah

I have worked in Computing and IT for over 20 years, in system development and support, research for persons with visual impairment and who are deaf-blind and later in knowledge management, before becoming a teacher over 20 years ago. I worked in state, independent, and special schools teaching children from both primary and secondary education. Working in a school specialising in autism, I completed a Master's degree with a thesis investigating whether autistic children were pre-disposed to learn coding. Until May 2022, when I moved to India, I worked for the National Centre for Computing Education (NCCE) in the UK training teachers. As part of the responsibilities at the NCCE I developed and co-authored courses and resources for teachers supporting computer science education for autistic students. I am currently undertaking a PhD in Sustainable Development at Amrita Vishwa Vidyapeetham University, with a focus on the United Nations Development Goal 4: Education, inclusion and Autism Spectrum Disorder (ASD). The PhD study focuses on involving teachers in screening and supporting autistic children in rural communities.

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