Building Recommendations for Conducting Equity-Focused, High Quality K-12 Computer Science Education Research

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

Sarah Heckman
sarah_heckman@ncsu.edu
North Carolina State University
Raleigh, North Carolina, USA

Christos Chytas
c.chytas@uu.nl
Utrecht University
Utrecht, The Netherlands

Lien Diaz
ldiaz@cc.gatech.edu
Constellations Center for Equity in
Computing, Georgia Tech
Atlanta, Georgia, USA

Michael Liut
michael.liut@utoronto.ca
University of Toronto
Mississauga, Ontario, Canada

Vera Kazakova
vakazakova@knox.edu
Knox College
Galesburg, Illinois, USA

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

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

Claudia Szabo
claudia.szabo@adelaide.edu.au
University of Adelaide
Adelaide, South Australia, Australia

ABSTRACT

To investigate and identify promising practices in equitable K-12 computer science (CS) education, the capacity for education researchers to conduct this research must be rapidly built globally. Simultaneously, concerns have arisen over the last few years about the quality of research that is being conducted and the lack of equity-focused research.

In this working group, we will tackle the research question: *In what ways can previous research standards inform high-quality, equity-focused K-12 CS education research?*

We will use existing research and various standards bodies (e.g., European Educational Research Association, Australian Education Research Organisation, CONSORT, American Psychological Association) to synthesize key features in the context of equity-focused K-12 CS education research. We will then vet these attributes with experts who can provide feedback and refine our recommendations and guidelines. Our working group will select the experts using a strata reflecting a diversity of backgrounds and experiences to support our focus on student populations that have been historically marginalized in computing (e.g., low-income students, rural students, girls, students with disabilities).

Our recommendations will directly impact future equitable computing education research by providing guidance on conducting high-quality research such that the findings can be aggregated and impact future policy with evidence-based results. While we recognize that different countries and regions may yield differing answers to this question, our recommendations will be robust enough that researchers in each country or region may choose to use those most appropriate to their context.

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

1 STUDY DETAILS

Concerns have arisen over the last few years about the quality of research that is being conducted on computer science education [1, 3, 5, 6]. There have also been multiple calls within the community to recognize the gaps in research of student participants [4, 7]. To investigate and identify promising practices in equitable K-12 computer science (CS) education, the capacity for education researchers to conduct high-quality research that delivers promising practices to teachers globally must be rapidly built.

Our objective for this working group is to develop recommendations for expanding coverage of high-quality, equitable K-12 computing education research. To engage in this work, our proposed plan includes six phases. These four phases will be discussed with the working group members at the first meeting so we can reflect on how to improve the research design. We will revise the design

if ideas are brought forth that can improve its design while still being able to maintain a reasonable scope. However, the intent of the research and the focused deadlines will remain unchanged.

2 PHASES OF OUR WORK

2.1 Phase I: Define *high-quality* and *equity-focused*

Unfortunately, some still view addressing the needs of marginalized students and diversity, inclusion and equity as being at odds with *high-quality*. In this initial phase, we will reflect upon what is meant by the phrase *high-quality* education research and *equity-focused* education research, creating definitions for each. By defining this terms, we can ensure that our group is focused on the same objective and provide the community with tools for broader discussions about these terms.

2.2 Phase II: Review quality gaps and standards bodies

In this phase, we will summarize key features of high-quality research from education research standards bodies. For this activity, we will use 1) a comparative research design [2] to review a set of international education research standards bodies, 2) a literature review to define previous finding on quality gaps and equity gaps in existing K-12 CS education research.

2.3 Phase III: Define key recommendations

In this phase, we will create a set of recommendations that align well with closing the gaps to bring education research. Using our knowledge of the gaps and the standards from Phase II, we will discuss and create a proposed set of recommendations for the K-12 CS education research community.

2.4 Phase IV: Vet recommendations

In this phase, we will vet key recommendations with experts in equity-focused research in K-12 computing education. For this qualitative study, we will develop a strata for identifying ten experts in the field. We will then use a focus groups design to solicit feedback on our comparative analysis and recommendations.

2.5 Phase V: Finalize manuscript

We will write parts of the manuscript during each phase. However, this phase will be focused on finalizing the manuscript text. We will then submit the manuscript for review.

2.6 Phase VI: Revise manuscript based on reviews

During this phase, we will revise the manuscript based on feedback received by reviewers.

3 CONCLUSION

Our working group intends to understand the tension between the often used terms high-quality and equity-focused and provide guidance on how our community can define these terms. This project will build off of existing knowledge from various, related fields, while also creating new knowledge that the growing K-12 CS education research field can use to adopt and use in future research.

ACKNOWLEDGMENTS

REFERENCES

[1] Sally Fincher, Raymond Lister, Tony Clear, Anthony Robins, Josh Tenenberg, and Marian Petre. 2005. Multi-institutional, multi-national studies in CSEd research: Some design considerations and trade-offs. In *Proceedings of the first international workshop on computing education research*. 111–121.

[2] Alexander L George and Andrew Bennett. 2005. *Case studies and theory development in the social sciences*. mit Press.

[3] Sarah Heckman, Jeffrey C Carver, Mark Sherriff, and Ahmed Al-Zubidy. 2021. A systematic literature review of empiricism and norms of reporting in computing education research literature. *ACM Transactions on Computing Education (TOCE)* 22, 1 (2021), 1–46.

[4] Monica M McGill, Sloan Davis, and Joey Reyes. 2022. Surfacing Inequities and Their Broader Implications in the CS Education Research Community. In *Proceedings of the 2022 ACM Conference on International Computing Education Research-Volume 1*. 294–308.

[5] Monica M McGill, Adrienne Decker, Tom McKlin, and Kathy Haynie. 2019. A gap analysis of noncognitive constructs in evaluation instruments designed for computing education. In *Proceedings of the 50th ACM Technical Symposium on Computer Science Education*. 706–712.

[6] Kate Sanders, Judy Sheard, Brett A Becker, Anna Eckerdal, and Sally Hamouda. 2019. Inferential statistics in computing education research: A methodological review. In *Proceedings of the 2019 ACM conference on international computing education research*. 177–185.

[7] Bishakha Upadhyaya, Monica M McGill, and Adrienne Decker. 2020. A longitudinal analysis of k-12 computing education research in the united states: Implications and recommendations for change. In *Proceedings of the 51st ACM Technical Symposium on Computer Science Education*. 605–611.