csedresearch.org: Resources for Primary and Secondary Computer Science Education Research

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

Adrienne Decker
University at Buffalo
Buffalo, NY, USA
adrienne@buffalo.edu

ABSTRACT

In this Tips, Techniques, and Courseware talk, we will provide an overview of csedresearch.org, a site designed to provide resources for primary and secondary computer science (CS) education researchers. This resource center has three primary functions: 1) to provide a quick and easy way to search and access manually-curated data from over 500 articles from ten targeted venues (currently 2012-2018), 2) to provide a centralized location for evaluation instruments, many of which are focused on computing, and 3) to provide resources for computer science education research (checklists for studies, how to design a study, how to write a research question, etc.). Users can search for articles by filtering at a granular level on various curriculum and activity components, including student demographics, instructor demographics, and program components. Users can also search for evaluation instruments on criteria such as type, year published, constructs measured in the instrument, and whether the instrument has been validated or tested for reliability. We will provide a brief summary of the rationale for the site, the current state of the site, and how educators and researchers are using the site to date. We will also discuss future plans for the site and enable the audience to provide feedback that may help us shape the site to better meet the needs of the community.

CCS CONCEPTS

• **Social and professional topics** → **Computing education; Computing education programs; Computer science education; K-12 education.**

KEYWORDS

Educational research, resources, evaluation, assessment, constructs, K-12, primary, secondary, cognitive, noncognitive

ACM Reference Format:

Monica M. McGill and Adrienne Decker. 2019. csedresearch.org: Resources for Primary and Secondary Computer Science Education Research. In *Innovation and Technology in Computer Science Education (ITiCSE '19)*, July 15-17, 2019, Aberdeen, Scotland, UK. ACM, New York, NY, USA, 2 pages. <https://doi.org/10.1145/3304221.3325545>

Permission to make digital or hard copies of part or all of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. Copyrights for third-party components of this work must be honored. For all other uses, contact the owner/author(s).

ITiCSE '19, July 15-17, 2019, Aberdeen, Scotland, UK

© 2019 Copyright held by the owner/author(s).

ACM ISBN 978-1-4503-6301-3/19/07.

<https://doi.org/10.1145/3304221.3325545>

Figure 1: csedresearch.org

1 OVERVIEW

It is often challenging to find articles that provide sufficient data to evaluate for effectiveness and for replicating the study or the activity/curriculum being evaluated [4]. csedresearch.org was originally conceived in order to collect data needed to discover empirically-based best practices for teaching K-12 computing across the demographic spectrum, with an eye towards improving the efficacy of outreach activities and curriculum for underrepresented groups [1-3] (Figure 1). As part of a five-year U.S. National Science Foundation (NSF) research project, the site now houses manually curated data from over 500 articles across ten targeted venues and over 150 evaluation instruments, with nearly half of these focused on computing. The goals of this research project include:

- Provide resources for the K-12 CS education research community in order to promote better reporting of the activity and/or curriculum and
- Improve data analysis in order to gauge the impact of the intervention on its participants.

By housing data from our intensive literature review across multiple years and journals on one free, publicly accessible site, we have made it easier for those in the K-12 community to find previously published works in their areas of interest.

1.1 Research Articles

We seeded the collection of article data by curating data from articles related to K-12 CS education from each of the following ten journals (2012-2018) across five different publishers:

- ACM International Computing Education Research (ICER)
- ACM Innovation and Technology in Computer Science Education (ITiCSE)
- ACM Technical Symposium on Computer Science Education (SIGCSE)
- ACM Transactions on Computing Education (TOCE)
- Frontiers in Education (FIE)
- IEEE Global Engineering Education Conference (Educon)
- IEEE Transactions on Education
- Journal of Educational Computing Research (JECR)
- Koli Calling (Koli)
- Taylor & Francis Computer Science Education (CSE)

The article curation process includes organizing, evaluating, and parsing articles using a formal methodology [4]. The articles come from a variety of venues, and each article has been analyzed to identify its primary research questions, data that was collected as part of the study, the activities that were evaluated, and more. A team of ten people have been involved in identifying and analyzing articles. Each article undergoes two reviews.

1.2 Evaluation Instruments

In an effort to provide a centralized location for evaluation instruments related to computing education, we have curated over 150 evaluation instruments [1]. Over half of these instruments evaluate cognitive and noncognitive constructs related to computing [5].

By sharing a set of instruments that have been validated and tested for reliability in previous studies, researchers can easily find them and use or adapt them for use in their own studies. Not only does this save researchers valuable time, but if researchers start to use existing instruments when applicable, it may also provide better data for comparison across multiple studies and different demographic groups.

1.3 Research Resources

In addition to the above, the site continues to add resources for authors and those who review articles for publications. Included in this are how to write a research question and other guides currently under review. We provide two checklists on the site: a list of questions for ensuring that articles reporting on research in general and a list of program elements to include in the article.

2 THE PRESENTATION

In this talk, we will demonstrate several ways that primary and secondary educators, researchers, and evaluators interested in primary and secondary computer science education can use the cse-research.org resources. We will highlight and demonstrate how easy it is to engage in this as both a contributor to and as an end-user of this site and encourage collaboration and feedback from those in attendance as the site continues to evolve. We will show:

- how to perform article searches by filtering on relevant demographics,

- how to contribute relevant articles to the site,
- how to search for useful evaluation instruments based on type of study being performed or constructs being measured,
- how to contribute new evaluation instruments to the site,
- how to request a copy of the data for further research,
- how to find tips on conducting research, and
- as the site evolves and becomes more adopted by the community, we will show attendees the best mechanism for providing feedback and ideas on how to improve the site for individuals performing research.

3 AUDIENCE APPEAL

cse-research.org is designed for researchers, educators, and evaluators engaged in primary and secondary education. We expect that given the nature of topics addressed at ITiCSE, those falling in all three categories will be in the audience, with researchers and educators comprising the bulk of the attendees.

We have had considerable feedback on the website to date. Feedback from the community includes:

- I totally love the site, use it *all* the time and recommend it to others all the time. Thanks for the great work!
- The collection of evaluation instruments will be appreciated by graduate students for many years to come.
- Very useful and informative. Thanks for putting this together.

In addition to sharing this resource with those in attendance, we will actively seek their feedback so we can improve the site to make it even more meaningful for those in the CS education community working in this space.

4 CONCLUSION

We have designed and developed the site with input from researchers, educators, and evaluators, including primary and secondary teachers. Based on the feedback so far, this site is becoming an important resource for many in the community. Sharing this site with the ITiCSE community may help additional researchers save time and resources finding relevant articles or evaluation instruments.

ACKNOWLEDGMENTS

This material is based upon work supported by the U.S. National Science Foundation under Grant Nos. 1625335, 1649671, 1745199, and 1757402.

REFERENCES

- [1] Adrienne Decker and Monica M. McGill. 2019. A Topical Review of Evaluation Instruments for Computing Education. In *Proceedings of the 50th ACM Technical Symposium on Computer Science Education*. ACM.
- [2] Monica M. McGill and Adrienne Decker. 2017. Computer Science Education Repository. <https://cse-research.org>
- [3] Monica M McGill and Adrienne Decker. 2018. Defining Requirements for a Repository to Meet the Needs of K-12 Computer Science Educators, Researchers, and Evaluators. In *Frontiers in Education Conference (FIE)*. IEEE.
- [4] Monica M McGill, Adrienne Decker, and Zachary Abbott. 2018. Improving Research and Experience Reports of Pre-College Computing Activities: A Gap Analysis. In *Proceedings of the 49th ACM Technical Symposium on Computer Science Education*. ACM, 964–969.
- [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*. ACM, 706–712.