

Maryland Computing Education Expansion: From Grassroots to the MCCE

Jan Plane (moderator)
University of Maryland College Park
College Park, MD
jplane@cs.umd.edu

Rebecca Zarch
SageFox Consulting Group
Amherst, MA
rzarch@sagefoxgroup.com

Marie desJardins
University of Maryland Baltimore
County
Baltimore, MD
mariedj@umbc.edu

Dianne O'Grady-Cunniff
Charles County Public Schools
La Plata, MD
mrsdianneoc@gmail.com

Scott Nichols
Maryland State Department of
Education
Baltimore, MD
charles.nichols@maryland.gov

Pat Yongpradit
code.org
Seattle, WA
pat@code.org

CCS CONCEPTS

• **Social and professional topics** → **Computational thinking**;
Computing education programs; *K-12 education*; **Computational thinking**; **Computing education programs**; **K-12 education**;

KEYWORDS

Elementary schools; secondary schools; universities; public policy; broadening participation in computing education

ACM Reference Format:

Jan Plane (moderator), Rebecca Zarch, Marie desJardins, Dianne O'Grady-Cunniff, Scott Nichols, and Pat Yongpradit. 2018. Maryland Computing Education Expansion: From Grassroots to the MCCE. In *SIGCSE '18: SIGCSE '18: The 49th ACM Technical Symposium on Computing Science Education, February 21–24, 2018, Baltimore, MD, USA*. ACM, New York, NY, USA, 2 pages. <https://doi.org/10.1145/3159450.3159621>

1 SUMMARY

Over the past five years, computing education initiatives in Maryland have expanded to include pre-K through college with a focus on broadening participation among female and minority students. A grassroots movement has grown from a small core team of high school teachers and university professors to a statewide steering committee and the newly established Maryland Center for Computing Education (MCCE). In this session, we will discuss how the expansion began, the current status, and the future plans for Maryland computing education. Even though Maryland is a small state, this effort is extremely important since computing jobs are central to the economy. According to the U.S. Chamber of Commerce, Maryland currently ranks first in STEM job concentration and in the high-tech share of all businesses [7].

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).

SIGCSE '18, February 21–24, 2018, Baltimore, MD, USA

© 2018 Copyright held by the owner/author(s).

ACM ISBN 978-1-4503-5103-4/18/02.

<https://doi.org/10.1145/3159450.3159621>

2 SEEDING THE PROCESS

In 2010 and 2011, two Google-sponsored CS4HS workshops were held at the University of Maryland, College Park (UMD), and the University of Maryland, Baltimore County (UMBC). At the time, there were few professional development opportunities designed for CS teachers. To better understand the landscape of computing education in Maryland, we conducted an initial survey of CS high school teachers in 2012. Teachers reported the need for more professional development and collaboration among their peers because they tended to teach in isolation at their schools [3]. In 2013, we obtained NSF funding to create a curriculum and provide professional development for the new Advanced Placement Computer Science Principles (AP CSP) course [2]. The resulting CS Matters curriculum is freely available under a Creative Commons License [4]. At this time, our researcher-practitioner partnership (RPP) between UMBC, UMD, and local CS high school teachers also began to meet regularly to understand and influence the growing focus on CS education in the state. Since the 2012 survey, we have conducted two additional surveys (2014 and 2016) of CS high school teachers and utilized the information to identify needs across the state.

3 BUILDING COMMUNITY

To unite CS educators in Maryland, our RPP began the Computer Science Teachers Association (CSTA) Maryland chapter in 2011. An initial group of 13 computing educators founded CSTA-MD; the chapter has grown to 189 members in 2017. We also led efforts to expand computing education across Maryland with additional funding from the Expanding Computing Education Pathways (ECEP) Alliance. We have organized statewide CS education summits in 2013 (funded by NSF's CE21 program), 2016 (funded by an ECEP minigrant), and 2017 (funded by a ECEP minigrant with MSDE and industry support). Summits included educators from every public school system, many private schools, and higher education, as well as industry and government representatives. Our contact database includes over 1,000 educators and supporters.

4 CURRICULUM & TEACHER DEVELOPMENT

Maryland contains 24 local education agencies (LEAs) or school systems, which are organized at the county level except for the

Baltimore City Public School System. The needs and diversity of the public school systems vary across the state from the Appalachian Mountains to the Eastern Shore. Each LEA has local control of curriculum, but must comply with the Code of Maryland Regulations (COMAR) laws and report compliance to the Maryland State Department of Education (MSDE). The MSDE is scheduled to present CS standards to the State Board in June 2018. Professional development for teachers has increased significantly in the last three years. To date, CS Matters has trained 87 teachers and provided access to our curriculum to over 275 teachers in Maryland, across the country, and around the world. We work in collaboration with our CS education professional development partners (Code.org, PLTW, ECS, and others) and the USM-led Minority Student Pipeline Math Science Partnership in Prince George's County, one of the largest majority-minority school systems in the country. Equity, diversity, and access are central components in our efforts; the literature shows that this strategy is critical for ensuring success for all students [6]. In 2017, we began training pre-service and in-service elementary teachers in integration of computational thinking to expand that portion of the pipeline.

5 MONITORING PROGRESS

Our RPP created the Maryland Computing Education Steering Committee, consisting of educators, local industry, and government representatives who have interests in computing education. The steering committee developed 15-year goals to advance Maryland computing education, categorized into student access and participation, professional training, and curriculum and standards, with targeted milestone goals within each category. External evaluation provides formative and summative feedback on progress towards these goals. Though the state has built capacity by training teachers and increasing the number of schools offering CS, Code.org data show that there are still gender and race gaps in Maryland CS education: female students represent only 25% of AP CS A test takers and only 21% of students receiving CS bachelor's degrees [1]. However, the early data for gender and race inclusivity in the AP CS Principles courses this year are encouraging: nationally, African-American students make up only 4% of AP CS A students, but 16% of AP CSP students; Hispanics represent 18% of AP CSP students (vs. 9% of AP CS A students); and female students represent 28% of AP CSP students (vs. 22% of AP CS A students) [5]. In Maryland, there was even greater participation by female students in CSP courses: 35% of Maryland AP CSP exam participants were female.

6 CONTINUING THE GROWTH

The growth of computing education in the state over the course of our RPP indicates the strength of the coalition developed. The MCCE exists under the umbrella of the University System of Maryland, which includes 12 public universities in Maryland offering academic programs to more than 171,000 students at multiple locations throughout the state and worldwide. The PreK-20 Division of USM works directly with the Departments of Education in the universities to build partnerships with the local school systems. These partnerships work to strengthen educational achievement from elementary school through college and beyond, and also to improve teacher quality.

7 THE PANEL

The panel will describe our RPP's growth, encouraging audience participants to find analogies between their own state and Maryland, and providing lessons learned in bringing together various constituencies to create a cohesive and supportive partnership that promotes computer science for all. Following short presentations by each panelist, we will address a set of planned questions about challenges (identifying key individuals and organizations, underlying structures obstructing the proliferation of computing education, and obstacles preventing equitable participation across populations) and opportunities (understanding what went well in Maryland and how those parts of the process can be customized to their own state, the state's education structure and computer science's place in that structure, and how the context Maryland compares to other states). Time will be allocated for questions and discussion. The panelists bring multiple perspectives on our efforts to build a statewide center. Dr. Marie desJardins, Associate Dean for Academic Affairs in the College of Engineering and Information Technology at UMBC, is the recipient of the A. Richard Newton Educator ABIE Award and the NCWIT Undergraduate Research Mentoring Award. Mr. Scott Nichols, Technology & Engineering Education Supervisor at MSDE in the Division of Career and College Readiness, is a leader in K-12 CS and the implementation of Project Lead the Way. Ms. Dianne O'Grady-Cunniff, a CS teacher and past president of CSTA-Maryland, has participated in developing the K-12 CS framework, the national CS standards, and the PRAXIS CS teacher certification, in addition to leading CS teacher workshops. Mr. Pat Yongpradit, Chief Academic Officer for Code.org, has written and consulted on technology curricula at the local, state, and national level and was recognized as a Microsoft Worldwide Innovative Educator. Ms. Rebecca Zarch, Director at the Sagefox Consulting Group, has led the evaluation of K-12 CS education projects nationwide and has spent more than a decade evaluating projects related to STEM and workforce development. Dr. Jan Plane, Principal Lecturer in the Department of CS at UMD and Director of the Maryland Center for Women in Computing, was named a 2017 University of Maryland Woman of Influence and was recognized with awards from Women in Technology and the Women's Society of Cyberjutsu.

ACKNOWLEDGEMENTS

This work was supported by NSF through awards 1339265, 1339275, 1228355, 1160624, and 1639891, and by Google's CS4HS program.

REFERENCES

- [1] Code.org. 2017. Maryland fact sheet. Retrieved February 26, 2017. <https://code.org/advocacy/state-facts/MD.pdf> (2017).
- [2] Marie desJardins. 2015. Creating AP® CS principles: Let many flowers bloom. *ACM Inroads* 6, 4 (2015), 60–66.
- [3] Marie desJardins and Susan Martin. 2013. CE21–Maryland: The state of computer science education in Maryland high schools. In *Proceeding of the 44th ACM Technical Symposium on Computer Science Education*. ACM, 711–716.
- [4] CS Matters in Maryland. 2017. CS Matters AP Computer Science Principles Curriculum. Retrieved February 26, 2017. <http://csmatters.org/overview> (2017).
- [5] M.J. Mada. 2017. Is the College Board's newest AP computer science course closing the gap? *EdSurge News* (2017).
- [6] Jane Margolis, Joanna Goode, and Gail Chapman. 2015. An equity lens for scaling: A critical juncture for exploring computer science. *ACM Inroads* 6, 3 (2015), 58–66.
- [7] U.S. Chamber of Commerce Foundation. 2017. Enterprising States. Retrieved November 12, 2017. <https://www.uschamberfoundation.org/enterprisingstates/#MD> (2017).