involved time as a student teacher in the PDS Program, I had an extreme upper hand after being hired as a teacher at that same school. My familiarity with the school culture, norms, expectations, and initiatives allowed me to focus more on my students' needs- much more so than a first-year teacher would usually be able to do. Also, I student-taught in fourth grade and was hired as a fourth-grade teacher, so my intimate depth of knowledge of the standards set me apart. In some ways, I had the knowledge and insight of a second-year teacher, as I already knew the ways and customs of my school and grade level.

During my first year of teaching, I was invited to speak with a group of student interns who were interning at my school and taking site-based courses. The students were participating in the same PDS model in the same school, and were taught by the same professors I had. My professor, Dr. Jennifer Allen, offered me a unique experience that speaks volumes about the value of the PDS model and the relationships that are built and sustained through it. I was able to speak with the teacher candidates about effective instructional practices in literacy, most of which I had been implementing since I learned them in my PDS site-based courses. I was also able to relate to them, and inform them that their first year as teachers would be what they made it. I felt honored and validated to be able to speak with teacher candidates who were in the same place I had been sitting just one year before. I constantly operated from a sense of understanding and compassion for student interns that went through the program after me. I was able to relate to the desire to want the most out of the program, and the desire to want to connect to the school that would, essentially, become your "home away from home" for the last two blocks of your undergraduate career. This is yet another beautiful aspect of the PDS model – it can be used to mold beginning teachers into great role models and mentors who can continue to build the teaching profession by mentoring educators who are following in their footsteps.

Post-Intern PDS Opportunities

One of the greatest post-intern experiences of the PDS model for me is FitLit. FitLit is an after-school literacy program for fifth graders where the importance of fitness and literature are emphasized and practiced. The students meet one afternoon a week and use a fraction of the time to "get fit" by exercising with our school's PE Teacher and usually experiencing some type of fun sport or team-building activity. Following that, they come in and we all "get lit" by reading our novel aloud with each other and discussing and reflecting on what we have read. My university PDS professors, Dr. Jennifer Allen and Dr. Beth Scullin, are the creators of FitLit. Together, they choose a novel for the FitLit group to read that focuses on a social issue and a powerful theme. The students get to keep their very own copy of whichever novel is chosen, which is an amazing practice since many of my students do not have the thrill of being book owners. This even further connects our PDS school with our university, as our students forge and build relationships with pre-service teachers and professors from our partner university through the intimate discussions that emerge from our after-school FitLit meetings.

Cooperating Teacher

This year, with three years of teaching under my belt, I am flourishing in my role as a first-time Cooperating Teacher for a student intern who is part of my school's PDS program. It is important to me to continually work to bridge the gap that sometimes occurs between universities and the schools in which student interns are placed as part of their degree program. I strive to maintain healthy and supportive relationships with student interns as well as university supervisors. I encourage student interns as they grow and develop, help them think through their lesson plans, and give them genuine and honest feedback on their teaching and classroom management techniques. I also participate in mock interviews where I give feedback to teacher candidates to set them up for success for future job opportunities. I have also had the honor of speaking with different groups of graduating teacher candidates at The University of West Georgia, offering them advice, perspective, resources, and mentorship as they prepare to delve into their first year of teaching.

Continuing to Nurture the Partnership

I often think back to that first-generation college student who very anxiously awaited all that was in store for her. Now, when I look in the mirror, I am always grateful for the opportunities I was given to get a head start into my career before I was even a graduate. One of the National Association for Professional Development Schools nine essentials requires that the school have a "structure that allows all participants a forum for ongoing governance, reflection, and collaboration." The PDS model afforded me opportunities to see myself transform into the educator I always knew I could and would be through the shared collaboration and mutual investment in learning from all stakeholders involved. I plan to continue to support the PDS model by being a cooperating teacher who involves her student intern in the inner workings of not only the classroom but the school as well. I also plan to continue to nurture and maintain the healthy and strong relationships I have cultivated with my professors as I know that my students benefit from the opportunities they have to work with college professors and their current students in small groups, one-on-one, and after-school settings. Additionally, I continue to benefit by growing as a scholar and educator. Writing this article is one example of that. This wouldn't have been possible without the help of Dr. Allen, who coached and mentored me along the way. I know that my students and I will continue to grow exponentially as a result of the committed stakeholders who are invested in the PDS partnership between The University of West Georgia and Sand Hill Elementary.

Paige Partlow (paige.partlow@carrollcountyschools.com) is in her third year as a fifth-grade teacher at Sand Hill Elementary School, a PDS school that partners with the University of West Georgia.

Jennifer K. Allen is in her fourth year as an Assistant Professor of Literacy at the University of West Georgia.

The Importance of Research Practice Partnerships for Professional Development

Jennifer Pietros, Alan Shawn Feinstein School of Coventry (RI)
Sara Sweetman, University of Rhode Island

Research practice partnerships (RPP) intend to blur the lines of traditional teacher and researcher roles (Coburn & Penuel, 2016). Teachers who participate in RPPs gain experiences in research activities such as identifying problems of practice, designing research methods and data collection tools, collecting and analyzing data. They learn to be critical consumers of research and gain new perspectives for interpreting research into practice. Being part of an RPP can also inspire teachers toward more inquiry into their own practices and can support them to be leaders in their local community. An RPP is devoted to the ongoing advancement and improvement of teaching and learning which is an essential goal shared by Professional Development Schools (PDS). This paper shares one teacher's journey through the first year as part of an RPP team that was engaging in design-based Implementation research (DBIR). Her intellectual growth and motivation for engaging in the inquiry has been inspired by the opportunities that a research project has provided. In return the teacher has provided valuable insight to engaging in research and developing and disseminating knowledge.

Teacher Reflection

After reflecting on this past year of my teaching career, I am truly amazed by the number of opportunities and doors that have opened by being a teacher working with an RPP team. I am a sixth-grade science teacher who became a member of a design-based implementation research (DBIR) group. This group consists of 20 participants including elementary math and science coaches, classroom teachers (covering all grade levels K-5), district curriculum coordinators, and university educators across science, technology, engineering, mathematics and computing (STEM+C) content. We have all met to collaborate in monthly face-to-face research meetings for the past year to help understand the current landscape of computational thinking (CT) in elementary schools throughout the state of Rhode Island and improve STEM+C in elementary classrooms by integrating best practices. This work is part of an NSF STEM+C research grant entitled Computing in Elementary School: An Exploration of Computational Thinking Approaches and Concepts Across Disciplines (Sweetman, 2018-2020) (1813224).

When asked to join the research group I knew very little about computational thinking but thought it would be a wonderful experience to learn something new. I think becoming part of the DBIR group is one of the best decisions I have made in my teaching career. I have had an amazing experience that has led to an immense growth in my own learning along with my students. When I reflect back to a year ago in the knowledge I had concerning computing in the classroom, I am astounded by how much more I know in only a years' time. By being part of this collaborative group, I became inspired and motivated to attend numerous professional development opportunities in addition to our monthly meetings in order to contribute new knowledge and innovations about computational thinking to the DBIR group. The new knowledge I have obtained by being a member of this group is remarkable and has led me to the realization of just how important partnerships are for advancing learning. All members of this group have a shared commitment to innovative and reflective practices which is one of the PDS Nine Essentials created by members of the National Association for Professional Development Schools and effectively keeps pushing our thinking to become better educators and researchers (NAPDS, 2008)

The DBIR group has had numerous meetings throughout this past year and new levels of awareness are gained at each meeting. During our first research meeting the group investigated what computational thinking is and how important it is for students to learn how to solve problems. At this meeting, we compared different standards to look for similarities and differences. We looked at the *Computer Science for Rhode Island* (CS4RI) standards, *Computer Science Teacher Association* (CSTA) standards, *International Society for Technology in Education* (ISTE) standards, and *Barefoot Computing at School* (CAS) standards. We performed a crosswalk of the standards and discovered that there was not a shared language for computational thinking. While there was some shared terminology, there were also many differences. We found there was a frequent use of concepts such as: *abstraction, algorithm, patterns, and decomposition*. The research group decided it would be helpful if the concepts and language were more universal in order to clarify and support effective implementation. These findings revealed that in order to successfully spread awareness, it is very important to have a mutually understood shared language between the computer science community and educators. Bocconi et al. (2016) found similar conclusions and posits that clear definitions and conceptualizations lead to effective learning objectives and curricula.

Just by having that first meeting I had a better understanding of what computational thinking was by collaborating with different people and sharing our ideas as a whole group. I soon learned computational thinking was a problem-solving process that is broken down into different concepts and approaches. The main concepts are breaking a problem down into its component parts, known as *decomposition*. It involves looking for similarities or recognizing *patterns*. It includes learning how to pull out the important parts in solving a problem and removing the unnecessary details known as *abstraction*. It also entails creating a step by step procedure for solving a problem also known as creating an *algorithm*. I learned about some of the approaches to learning students have while solving a problem consisting of being creative, having perseverance, collaborating, being able to debug, and being able to tinker. By working with this group, I was able to understand examples of these different concepts and approaches and how they happen in the classroom. For example, when students create a procedure for planting a seed, they are using algorithms. When students create life cycles, they are practicing their decomposition skills. Finding similarities and differences in data collected in science represents identifying patterns. They are practicing abstraction when they make notes and charts of the most important properties in science or when they create models (Barefoot Computing, n.d.). I realized many of these concepts were already happening in the classroom, but they just were not explicitly taught using the computational thinking terminology.

I also began to have an appreciation for the importance of teaching computational thinking at the elementary level. I learned how important it is to increase access to computer science subject matter for every child because not only does it address the needs of the workforce and skills needed in the digital age, but more importantly it addresses foundational educational needs such as being able to think critically to solve problems, data analysis, and modelling skills (Papert, 1980, Khine, 2018). I learned one of the biggest challenges to integrating computational thinking into the elementary classroom will be having teachers buy-in to the changes that will need to be made in their practice. Teachers often feel uncomfortable when they are directed to implement something new which sometimes results in stress, anxiety, or even cynicism, especially if it involves teaching something, they know little about. By teachers having a voice at these meetings, researchers were able to hear some of their concerns about implementation and were insightful in coming up with strategies to meet these needs.

As a group we also reviewed and helped create a survey that would be sent out to over 40 elementary schools in Rhode Island to obtain information about their current practices with CT. We all worked together to improve the content and face validity of the computational thinking survey for elementary school teachers by providing feedback on the clarity of wording, layout and style, and likelihood elementary teachers would be able to answer the questions on the survey. We also have made suggestions for adding and deleting questions to help improve the survey. This survey will be helpful in influencing policy makers on the best practices for integrating computational thinking in elementary school curriculum in the future. Being part of the research design process has helped me, as a teacher, to more effectively sort through "research-based" strategies and curriculum and translate research into practice.

We also participated in value-mapping and crosswalk research using the concepts and approaches of computational thinking. Ryoo and Shea (2015) believe that educators and researchers bring different values, experiences, and languages to the table. However, through collaboration in value mapping, a shared investment in research questions and strategies are developed. Throughout the value mapping process several products were produced which included a Padlet, various multimedia reports, and posters. The padlet serves as a research hub that highlights different lessons found throughout K-5 curricula in different subject areas and grade levels, research articles, standards, and definitions created by the group. The multimedia reports were created for ELA, math, science, technology, arts, and social emotional learning and demonstrate computational thinking integration throughout the different subject areas and grade levels. Also, posters were created to hang in classrooms to spread awareness all designed and made by members of the group. Through this whole process our group has gained a better understanding of the CT concepts and approaches used across the curriculum. We recognize how CT is already occurring in existing curriculum while also finding areas where it can be easily integrated. The

"This new knowledge and experience I gained has been put to the test while delivering digital instruction during the COVID-19 pandemic."

beginning survey data is starting to reveal that the survey itself increases elementary teachers' awareness of computational thinking which will help with implementation efforts in the future.

This project has allowed for a great deal of training and professional development opportunities. This project has inspired me and a few of the other teachers in the group to take the ISTE Introduction to Computational Thinking for Every Educator Course, which is a 15-hour course that teaches educators how to integrate CT across different subject areas and grade levels. This course helps to increase awareness of CT and uses different examples of activities that integrate computational thinking in the different subject areas. The course also has participants create a plan or a lesson to incorporate CT into the curricula. The course has opportunities for discussions about CT and provides a platform for educators to share lessons they create with people all over the United States and other countries that have integrated the four components of computational thinking which include decomposition, abstraction, recognizing patterns, and creating algorithms. I created a lesson for this course on a cell model project I do in my classroom where I explicitly added computational thinking terminology into the project and ended up using this lesson for my evaluation this year.

I had a wonderful opportunity this past summer when I attended the ISTE national conference in Philadelphia and learned more about computational thinking from experts in the field and research being conducted in other states. At this conference, I was able to see our research groups' work presented by Sara Sweetman in a talk entitled: No Time No Problem Integrating Computational Thinking Across the K-5 Curriculum. In addition to this professional development, I participated in a weeklong Digital Literacy Institute where I worked with a media specialist teacher from Barrington, RI to design a digital site for educating others about computational thinking and how it can be integrated into lessons. Participants who attended the institute came from 17 different states and 5 different countries and were able to view the product created which helped spread more awareness about computational thinking. I also attended a week-long code.org training for CS Discoveries which has computational thinking embedded throughout all the lessons to get a better handle on how coding is involved in computational thinking. Through this experience, I met a network of 30 other educators who are implementing a curriculum that uses CT. I also became a member of the Computer Science Teacher Association (CSTA) where I attend monthly meetings to stay informed of the Computer Science for all of Rhode Island (CS4RI) Initiative. At one of the local meetings someone from the National Integrated Cyber Education Research Center (NICERC) presented a pilot curriculum for integrating CT into third to fifth grade science, English, and math lessons.

Another opportunity I had with the DBIR group is a small group of us teacher leaders presented at the Rhode Island Science Teacher Association conference. At the conference we introduced teachers to the ideas of computational thinking and asked them to participate in different activities and think about where CT concepts and approaches were evident throughout the activities. In addition, I participated in a course entitled Inclusive Teaching in Computer Science: Be an Agent of Change. In this course I learned how to tackle some of the biggest challenges facing computer science education such as implicit bias, racism, sexism, and ableism to expand my teaching practices to be more inclusive to students who are historically underrepresented in computer science.

When reflecting on this past year I realize my thinking has changed a great deal. I originally started out as a teacher who knew little about computational thinking and thought it was about teaching math in the classroom. I now have a solid understanding of what CT entails and consciously add it to my lessons and see many opportunities in different subject areas. I also make sure I explicitly state the different terms such as decomposition, abstraction, finding patterns, and creating algorithms when my students are demonstrating these concepts in the classroom. I have learned about the value of CT being integrated into curriculum and have shared my knowledge with colleagues in my building and others in the state. In addition, I have had the opportunity to collaborate with a diverse team of people who have different perspectives and ideas about CT. This has allowed me to think about CT in ways that are different from my original thinking which has motivated me to learn more about this topic. I have used many of the resources from our meetings in my lessons and the poster created by the group about CT hangs in my classroom along with many other classrooms for students throughout Rhode Island to see. By working with this DBIR group, I truly feel I have a network of support and have not been afraid to take risks in the classroom when trying new lessons. This new knowledge and experience I gained has been put to the test while delivering digital instruction during the COVID-19 pandemic. It has allowed for an easier transition when taking risks in this new way of teaching and has helped with effective collaboration among colleagues, the sharing of resources, and communication within my community to meet the needs of our students. It has been an honor working with such a diverse group of educators and researchers and I hope every teacher can experience this type of partnership in their career.

Implications

The implementation of integrated computational thinking in elementary school throughout the state will be more viable because practicing teachers participated in the research. In addition, the work ahead which includes the translation of research to practice will be well guided by the teachers who participated in the research project. The relationships and trust that was built between the researchers and the practitioners will continue to benefit both communities. Researchers will have access to authentic problems of practice and real-world lab classrooms to test instructional activities and effective teaching practices; while teachers will be able to co-engage in the inquiry process, gain professional learning experiences and resources to continually improve student learning. Recent experiences with distance teaching have shown the need for teachers to have confidence and be able to take risks to cope with future educational challenges. Partnerships between K-12 and university educators will allow for the support essential in creating and delivering reflective and innovative instruction using best practices for computational thinking.

References

Barefoot Computing. (n.d.). Retrieved from https://www.barefootcomputing.org

Bocconi, S., Chioccariello, A., Dettori, G., Ferrari, A., & Engelhardt, K. (2016). Developing computational thinking in compulsory education-Implications for policy and practice (No. JRC104188). Joint Research Centre (Seville site).

Coburn, C. E., & Penuel, W. R. (2016). Research-practice partnerships in education: Outcomes, dynamics, and open questions. Educational Researcher, 45(1), 48-54.

Khine, M. S. (Ed.). (2018). Computational Thinking in the STEM Disciplines: Foundations and Research Highlights. Springer.

National Association for Professional Development Schools. (2008). What it means to be a professional development school. Retrieved from: https://napds.org/nine-essentials/

Papert, S. (1980). Mindstorms: Children, computers, and powerful ideas. Basic Books, Inc.

Ryoo, J & Shea, M. (2015) Value Mapping An activity for surfacing power dynamics and diverse perspectives in research-practice collaborations. Research Practice Collaboratory.

Sweetman, S. (Principal Investigator). (2018-2020). Computing in Elementary School: An Exploration of Computational Thinking Approaches and Concepts Across Disciplines.

Jennifer Pietros (pietrosjennifer@coventryschools.net) is a sixth-grade science teacher who has been teaching in Rhode Island for over 17 years. She is part of a research team exploring computational thinking.

Sara Sweetman is an assistant professor of education at the University of Rhode Island (URI) and directs URI's School of Education's Guiding Education in Math and Science Network (GEMS-Net).