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NEWS RELEASE

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New Report Showcases Studies on Integrating Computational Thinking into PreK–5th Grade Settings

Emphasizing Empirical Evidence, Research Offers Insights for Educators

New York, NY, January 20, 2022 – ACM, the Association for Computing Machinery, has published *Computational Thinking in PreK-5: Empirical Evidence for Integration and Future Directions*. While including computer science in the K–12 curriculum is a relatively new practice that has grown considerably in the last decade, the idea of introducing elementary school students to computing is an even newer frontier. This first-of-its kind ACM report presents nine separate studies which measure the impact of various approaches to integrating computational thinking in PreK–5th grade classrooms.

The studies showcase how to teach computational thinking at the elementary level and present clear examples, specific activities (including activities that use computer devices and activities that do not), ideas for applying computing to different subjects—such as math, science and language arts, as well as approaches that have proven effective for different grade levels.

A general description of computational thinking was first proposed by data scientist Jeanette Wing in 2006. Wing argued that thinking computationally was a fundamental skill for everyone, not just computer scientists. She maintained that exposure to the core principles of computational thinking, including pattern recognition, abstraction, and decomposition would enhance student learning in many areas—from reading and writing to arithmetic.

“Studies have shown that being introduced to computational thinking does enrich learning,” explained Aman Yadav, a co-editor of the new ACM report, and Professor of Educational Psychology at Michigan State University. “While educators are beginning to introduce computational learning in PreK through 5th grade classrooms, this is a new endeavor and there are still many questions. Encouraging and disseminating research is an important first step. In developing this report, we put out a call to the computer science education community so that we could compile the most up-to-date research in this area. We hope educators will be inspired by the innovative approaches outlined here and reassured by the methodologies the researchers used to measure the impact of these different programs.”

A key focus of *Computational Thinking in PreK-5: Empirical Evidence for Integration and Future Directions* is the idea of *integration*. The computer science education community is aware of the numerous demands placed on elementary school teachers and recognizes that there are not enough hours in the school day for computational thinking to be introduced as a separate discipline. The focus of the ACM report, therefore, was to present research on programs that *integrated* computational thinking to *existing* elementary school curricula.

In addition to saving in-class time and improving learning in traditional subjects such as math or reading, the co-editors of the report maintain that integrating computational thinking at the elementary school level enhances equity and access.

"Subjects such as computing and robotics are offered as after school or weekend programs in many districts," added Anne Ottenbreit-Leftwich, a co-editor of the ACM report and Professor of Instructional Systems Technology at Indiana University. "Arranging transportation for extra-curricular activities can often be a challenge for economically disadvantaged parents. When these concepts are introduced during regular school hours, it ensures that everyone has access to them. It's also important for students from traditionally underrepresented groups to be exposed to computing ideas early on so they don't feel alienated by the subject later."

The co-editors conclude the report by emphasizing that understanding the impact of computational thinking in PreK–5th grade settings is still in its early stages. They maintain that the field still needs to identify developmentally appropriate practices and learning goals for elementary students. They advocate for more research to examine how to integrate computational thinking into other subject areas, benefiting both computational thinking and computer science.

Computational Thinking in PreK-5: Empirical Evidence for Integration and Future Directions was developed under the aegis of the ACM Education Board and sponsored by the Robin Hood Learning and Technology Fund.

About ACM

ACM, the Association for Computing Machinery, is the world's largest educational and scientific computing society, uniting computing educators, researchers and professionals to inspire dialogue, share resources and address the field's challenges. ACM strengthens the computing profession's collective voice through strong leadership, promotion of the highest standards, and recognition of technical excellence. ACM supports the professional growth of its members by providing opportunities for life-long learning, career development, and professional networking.

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