Developing a Suite of Standards-based Instructionally Supportive Tools for Middle School Computer Science (ASSIST-MSCS)

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SRI Education

Project Goal

Support diverse middle school computer science (CS) teachers teaching a variety of CS curricula using different programming languages by providing professional learning opportunities tied to CS standards instead of a specific curriculum and specific programming representation.

ASSIST-MSCS will support middle school CS teachers to help them:

- Develop a deep understanding of **CS standards**
- Develop **formative assessment practices** (how to develop and use formative assessments to inform instruction)
- Understand **alignment of CS standards with curricular activities and assessment tasks**

Empowering teachers with increased CS pedagogical content knowledge will eventually result in improved student learning.

Research Questions

RQ1 (a): How can CS standards-aligned educative instructional supports be designed to be informative and useful to middle school CS teachers using different CS curricula?

RQ1(b): What professional development (PD) do teachers need to be able to use and benefit from these educative instructional supports?

RQ2: What are the different ways in which teachers adopt and use the standards-aligned educative resources and instructionally supportive CS assessments in their CS classes?

RQ3: How can standards-aligned instructional supports and teacher PD improve middle school teachers' CS PCK and improve their implementation of standards-aligned CS instruction?

Standards Covered

Middle school standard	CS concept emphasized
2-AP-10	Algorithms
2-AP-11	Variables
2-AP-12	Control structure combinations (nested loops and conditionals, compound conditionals)
2-AP-13	Decomposition
2-AP-14	Procedures

Teacher Supports Being Developed

Support	Description
Unpacking the standards	These documents break down each standard into fine-grained learning targets, present examples of the learning targets using three different programming languages (Scratch, JavaScript, and Python), elaborate boundaries for the standard, and outline known student challenges associated with the standard.
Assessment Design Specifications	Provided both at the standard level and at the learning target level, these documents describe how assessments can be developed by connecting learning targets to desired evidence to task features.
Formative Assessment Tasks, Scoring Guides, and Follow-up Strategies	These documents show how to use the assessment design specifications to develop assessment tasks by providing example tasks in two languages, scoring guides for the tasks, and follow-up strategies for responding to student performance on the tasks.

Study Design
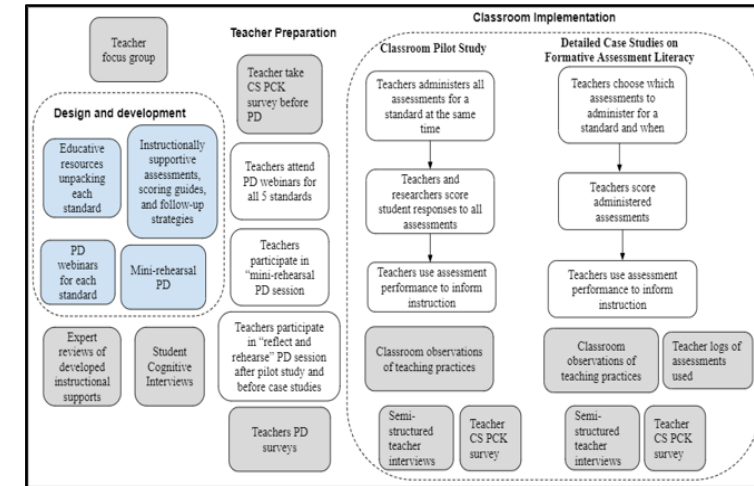
Findings from Teacher Focus Groups

- Focus group with 12 teachers from a diverse school district in Midwest U.S.
- Teachers have a range of experience in teaching CS and a range of teaching contexts, from integrated to stand-alone CS.
- There is no CS professional development provided by the district; teachers who participate in a RPP have received curriculum-specific PD.
- Teachers indicated that their lack of CS content knowledge is a challenge when helping their students.
- Teachers were not familiar or slightly familiar with CS standards (CSTA and/or state standards). Their district follows standards-based grading, but standards are general technology standards and not specific to CS.
- Teachers infrequently use formative assessments or use the ones provided by the curriculum, but would like to learn more about how to formatively assess and help their students.