

OUSD Perkins Grant Form

CTE Teachers Names:

Sonia Spindt

CTE Pathway Name:

Computer Science

2019-2020 Award Amount:

?

CTE Special Project Description:**The Problem:**

There is no agreed upon way to measure how well students are learning fundamental programming concepts within introductory computer science (CS1) courses. As a result, it is difficult to assess current student understanding of these topics and consequently, provide targeted and early intervention for students who are struggling. Timely and appropriate intervention methodologies are especially important to consider within K-12 computer science coursework because a students' perceived success within these courses is largely responsible for long-term engagement within the field. Without well structured and researched formative assessments, it is impossible to accurately gauge which students do not understand and more importantly, which students are at risk for developing negative CS identities.

Proposal:

The CS1 Assessment project will enable computer science instructors from across Oakland to more efficiently improve their students' ability to program via the collection and analysis of meaningful student performance data. The assessments developed within this project will be independent of programming language and administered electronically to ensure that their administration and analysis is manageable. Additionally, the project will include instructional protocols that empower students to act on recent assessment categorization information. These protocols will leverage current student expertise to aid students who are struggling while cementing concepts for those who have already constructed the correct mental model. Research has consistently shown peer instruction strategies to be more impactful in the revision of student misconceptions overtime, and is a fundamental component of this project's projected success. Finally, the project aims to incentivize computer science instructors from multiple schools to use and contribute their classroom performance data to a centralized database so that future examination of CS1 curriculum effectiveness can be conducted.

The following timeline is proposed in order to meet the objectives described above:

Phases (Carried out over 2 years):

- 1. Identify common mental models used to reason about the following CS1 concepts:**
 - a. Variables/Assignment → [Example Question](#)
 - b. If Statements/Selection
 - c. Loops/Iteration
 - d. Functions/Methods
 - e. Arrays/Lists
- 2. Develop formative assessments to help teachers identify mental model subpopulations.**
- 3. Develop peer instruction protocols that push students to reinforce correct mental models and revise incorrect mental models.**
- 4. Provide professional development for CS instructors on how to administer assessments, analyze assessment responses, and engage students in peer instruction protocols.**

Detailed Costs:

1. Research -- literature review and focus group administration (\$50.00/hour for a total of 100 hours).
2. Curriculum development -- question bank for each programming concept and peer instruction protocol (\$50.00/hour for 100 hours).
3. Professional development workshops -- development and implementation of workshops (\$50.00/hour for 30 hours).
4. Stipends for instructors who participate in the workshops and utilize assessments within the classroom (\$500.00 per instructor who fulfills both).

Total: \$16,500

Linked Learning Pathway Lead informed?

Yes

Site Principal informed of application?

Yes