

## Using Subgoal Labeling in Teaching CS1

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Subgoal labeling is an instructional design framework for breaking down problems into pieces that are small enough for novices to grasp, and often difficult for instructors (i.e., experts) to articulate. Subgoal labels have been shown to improve student performance during problem solving in disciplines both in and out of computing. Improved student performance occurs because subgoal labels improve student transfer and retention of knowledge. With support from NSF (DUE-1712025, #1712231), subgoal labels have been identified and integrated into a CS1 course (variables, expressions, conditionals, loops, arrays, classes). This workshop will introduce participants to the materials and demonstrate how the subgoal labels and worked examples are integrated throughout the course. Materials include over 100 worked examples and practice problem pairs that increase in complexity and difficulty within each topic. The materials are designed to be integrated into CS1 courses as homework or classroom examples and activities. Assessment of topics using subgoal labels will also be discussed. Participants will also engage in an activity where they create an example for their own course using subgoal labels.

**Keywords:** subgoal labels; CS1; introductory programming; worked examples; cognitive load theory

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