

Using Subgoal Labeling in Teaching CS1

Adrienne Decker, *University at Buffalo*

Briana Morrison, *University of Virginia*

Austin Cory Bart, *University of Delaware*

Contact: adrienne@buffalo.edu

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 many disciplines, including computing. Improved student performance occurs because subgoal labels improve student transfer and retention of knowledge. With support from NSF (DUE-1712025, 1712231, 1927906, 2110156, 2111578), subgoal labels have been identified and integrated into a CS1 course (variables, expressions, conditionals, loops, arrays, classes) and an e-book has been created on the Runestone platform to enable students to complete practice problems using the subgoals. This workshop will introduce participants to the materials and demonstrate how the subgoal labels and worked examples are integrated throughout the course. Materials include nearly 50 worked examples and 300 practice problems 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 leave with access to the e-book containing worked examples and practice problems for common topics in an imperative Java-based CS1 and will also engage in an activity where they create an example for their own course using subgoal labels.

Keywords: subgoals; CS1; introductory programming; worked examples

DOI: <https://doi.org/10.1145/3478432.3499164>