Validating a SOLO framework on HtDP-based Program-Design

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Dissertation Goal

Develop a conceptual framework of how novice programmers use HtDP to design programs.

To this end, we have developed a SOLO-based framework that details the skills that students from a single HtDP course use, as well as the variations in the way students applied each skill.

—we coded for these skills and skill-level variations from think-aloud and interview data collected from students as they designed solutions for programming problems.

Current questions

- What does it mean for the framework to be valid?
- How do I validate this framework?

How to Design Programs

HtDP teaches a multi-step process called the design recipe. The curriculum is used in several higher education institutions and some K-12 programs.

Hypothesis

If the framework is valid –

- HtDP instructors would agree that the framework captures (1) the skills they expect students to demonstrate and (2) the nuances/details with which they differentiate one skill level from another
- The quality of students’ skill performance would reliably be reflected in the framework – for example, when instructors use the framework to grade students’ skill performance, each student would get the same rating per skill from multiple instructors
- The previous two items hold across instructors and across institutions

Method 1: Validation with instructors

HtDP instructors will rate students on the skills identified in the framework, based on students’ think-aloud/interview transcripts and code solutions.

1. Instructors will be given categories of skills on which to rate students, but not the breakdown into levels (prestructural, etc.) – they will rate students’ demonstration of the skills on a numeric scale (e.g. 0 – 4) and explain their ratings.
2. Instructors will also report skills/factors they think weren’t covered in the set of skills provided.
3. Our analysis of the data will check for the following:
   a. If the instructors’ explanations of their ratings correlate with the skill levels of the framework
   b. If the set of skills in the framework is consistent with what instructors expect students to demonstrate or what they grade students on

Method 2: Validation with new student cohorts

1. We will replicate our previous study on HtDP-based CS1 student cohorts from 1-2 other schools – students will design solutions to programming problems as they think aloud.
2. We will code for the skills displayed by these students and contrast them to those from our original dataset. We will also code for the levels within the skills to check if the same levels arise in students’ demonstration of the skills.

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