ANALYZING DESIGN SKETCHING ABILITIES

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What are the steps in learning design sketching? Item Response Theory (IRT) can clarify challenges & knowledge development.

VALUE

This IRT analysis process ...
- improves teaching through reflection about objectives and the steps for achieving them.
- assesses individual & group skills. We examined beginners and included designers for a range of skills.
- clarifies the progression of difficulty by illustrating how students construct knowledge. I.e. almost all could draw the given plan in correct proportions, and many spaced columns, even though only—a half—draw a measurement grid. We found that using a grid is a precursor skill to the most difficult ability: drawing ALL program areas to the correct size.
- can sort out key learning domains so we can tailor lessons for different student aptitudes.

CONSTRAINTS

- Clear criteria don’t fit open-ended problems. The simpler criteria are to score (factual and discrete), the less they capture higher-level mastery.
- Creative solutions often break rules, leading to a lower IRT assessment.
- Domains of knowledge can be conflated. A beginner’s design ideas can be hindered by lack of construction knowledge and poor graphic proficiency. Lack of window detail can be due to not knowing window framing, composition, or graphic deficiency. Looking at sketch designs over time can clarify interpretation.

1. Define task & learning constructs

We used the Berkeley Evaluation and Assessment Research (BEAR) assessment system and Rasch family modeling to analyze 81 space planning design examples. We identified relevant knowledge constructs or domains: Site Documentation, Programming & Planning and Graphics.

2. Score performance on ranked criteria

For each construct, we defined a progression of criteria that could be scored 1 or 0, such as: “Creates a thumbnail variation.” Taking each sketch, a single scorer rated criteria as Met or Not met, recording results on a spreadsheet. Taking each sketch, a single scorer rated criteria as Met or Not met, recording results on a spreadsheet

3. Tally achievement gradient, correlations

We assumed that Site Documentation, Programming and Graphics use different kinds of thinking, but performance on Site and Program overlapped; the different content areas rely on similar competencies for success. By running the ACER analysis again, we found revised constructs (Drawing to scale with proportions, Organizing program areas and Using graphic conventions) verified as independent knowledge domains.

4. Revise understanding of task

Tallying actual performance against our conjectures about relative difficulty allows us to correct the original assumptions, understand the problem in greater depth and reveal the subtleties of student abilities.

The data revealed what skills correlated to high performance on the most difficult task: drawing all spaces within 10%. (above)