The Use of Prototypes by Novice Designers

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Abstract

Professional designers have long recognized prototyping as an effective technique for product development and consider prototypes an essential tool in the product development process. Experienced designers frequently use prototypes iteratively throughout the design process to quickly learn from, and refine, the most promising concepts, but in education, prototyping is often viewed as an activity that occurs only to test and evaluate a chosen design.

In order to effectively teach students the benefits of prototyping, we must first understand how and when students currently incorporate prototyping techniques into their design process.

In this study, we examined how novice designers in the U.S. and Ghana used prototypes throughout their semester-long design courses. Here, we present how the reported use of prototypes among the 49 participants compared to expert prototyping best practice.

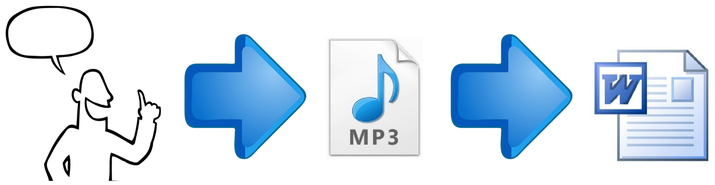
Methods

Participants:

	University of Michigan	University of Ghana
Female	8	5
Male	8	28
Total	16	33

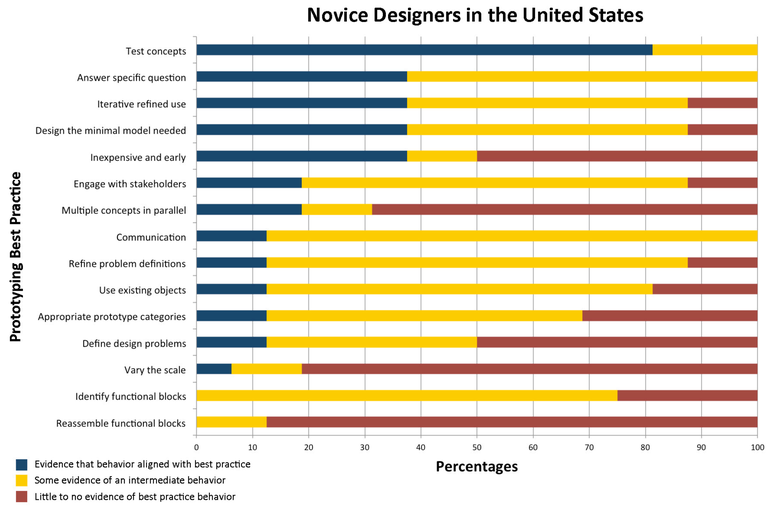
Research Questions:

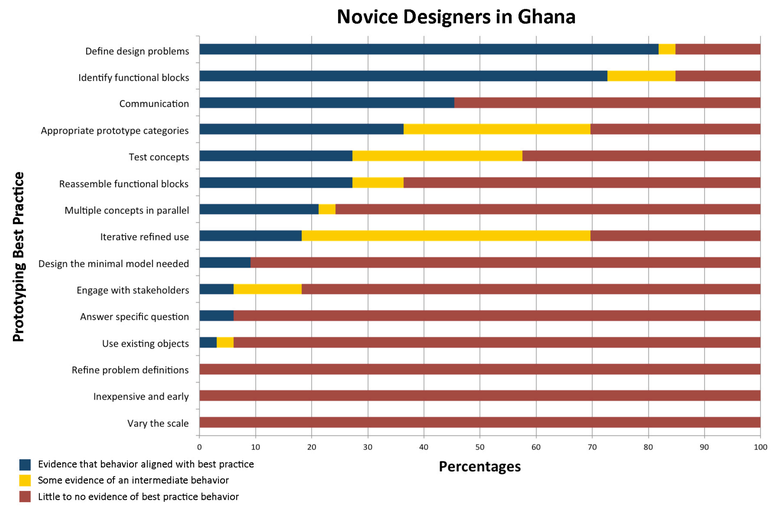
- How and when did students use prototypes during their semester-long design projects?
- To what extent did novice designers follow prototyping best practices?



- Semi-structured interviews with students who participated in project-based design courses
- Inductive and deductive coding

Comparing Prototype Use to Best Practices





Comparing Prototype Use across Cultures

How participants in the U.S. used prototypes:

- **Frequently** – to test concepts and answer specific design questions
- **Frequently** – to design the minimal model needed
- **Frequently** – to iterate and refine a design concept
- **Occasionally** – to generate quick and inexpensive models
- **Occasionally** – to engage with some stakeholders
- **Rarely** – to define design problems
- **Rarely** – to work on functional blocks

How participants in Ghana used prototypes:

- **Frequently** – to define design problems
- **Frequently** – to identify functional blocks
- **Occasionally** – to communicate within design team
- **Occasionally** – to test design concepts: primarily CAD
- **Rarely** – to iterate and refine a design concept
- **Rarely** – to engage with stakeholders
- **Rarely** – to refine the problem definition, and didn't use quick and simple prototyping, such as readily available materials or products

Implications for Teaching

Opportunities for increased prototype use emerged when comparing study findings to expert best practice: Physical models were underutilized in both the U.S. and Ghana.

Educators should encourage an increased use of physical prototypes to help novice designers to:

- Better define and redefine the scope of a project
- Identify and resolve functional blocks
- Increase communication between designers and stakeholders
- Evaluate physical properties like form factors and weight

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