

Scaffolding STEM Concepts by Adopting and Adapting Design Thinking

Research Problem

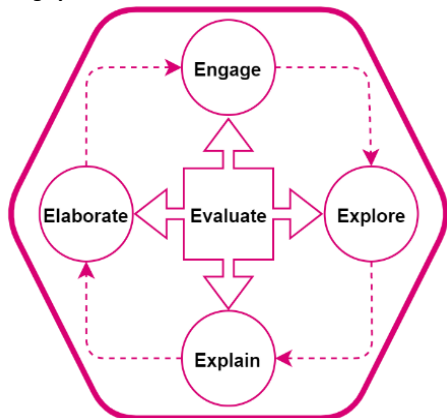
- Although learners get engaged in making and constructing their projects in a fab lab, a design-based approach is criticized with limited conceptual learning
- The complexity of the design experience due to multiple integrated objects, namely, skills, attitudes, content, and practices, leaves many of them under-exposed

Research Question

How can design thinking in Fab Labs be adapted to better scaffold STEM concepts for young learners?

Research Methods

- A Design-based research model is adopted with the aim of generating guiding principles for designing learning experiences that scaffold STEM concepts
- For the purpose of scaffolding STEM concept learning within the design thinking process, the **'discover'** stage is proposed
- The discover stage is a floating block that may attach to any design thinking stage, to serve its design outcomes
- The **discover** stage provides a space for the systematic exploration of new STEM concepts by following the 5Es learning cycle



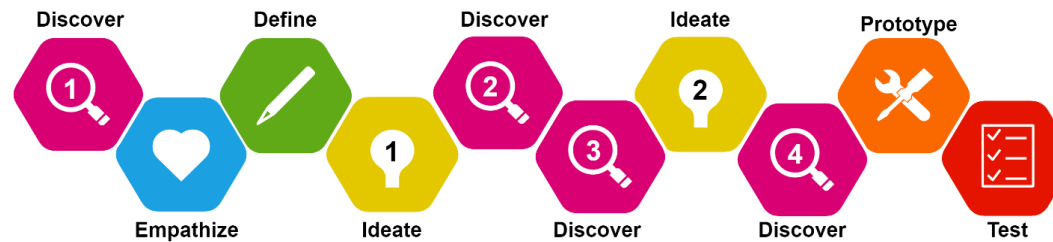
Lamiaa Nail

lamiaa.m.nail@aucegypt.edu

Heba El-Deghaidy

h.eldeghaidy@aucegypt.edu

Pilot Program Sequencing



Design Challenge

“Using Computer-aided Design and 3D Printing Technology, build assistive devices for people with motor disabilities”



Pilot Program Plan

Day 1	Day 2	Day 3	Day 4	Day 5
Discover motor disabilities	Define a problem and generate some ideas	Discover 3D Printing	Discover CAD	Continue prototyping
Empathize with target users	Discover assistive devices	Generate more ideas	Prototype assistive device	Test assistive device

Initial Design Principles

- learners explore new STEM concepts through inquiry using fab lab tools and machines
- learners perform human-centered research with real human users to uncover authentic needs
- Learners pinpoint one problem to tackle through collaboration in small groups
- Learners generate and select an idea that is supported with the newly learned STEM concepts
- learners develop low- and high- fidelity prototypes using fab lab machines and tools
- Learners explain their scientific reasoning and receive authentic feedback from users, peers, and teachers.