RAMAIAH
Institute of Technology

Design Thinking

(AEC16)

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UNIT: III

- Ideate Phase:
  - ✓ Demystifying Creativity, Innovation, and Originality
  - ✓ Ideate Principles
  - ✓ Pre-Brainstorming: Mindsets, Warm-Ups, and Practice

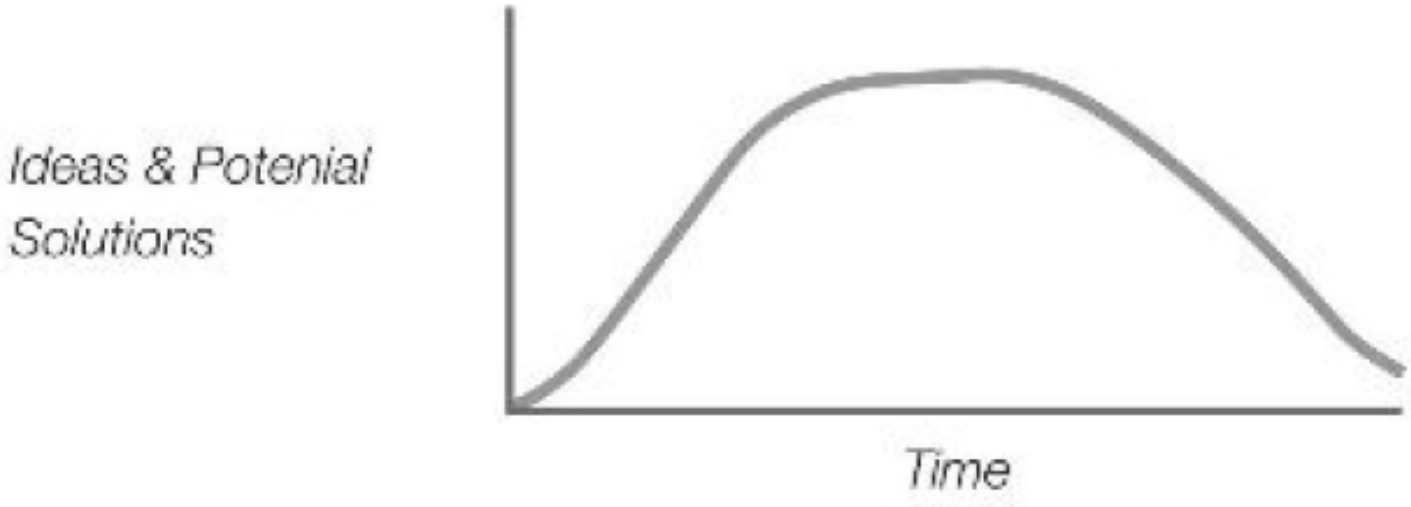
- Prototype Phase:
  - ✓ Rapid Prototyping
  - ✓ Prototyping in Action
  - ✓ Facilitation and Mentorship
  - ✓ Makerspace, Tools, and Materials

Ideate Phase

Use what you've learnt from the empathy work to generate multiple solutions for the problem statement devised.

Step 1: Generate MANY ideas

Step 2: Choose the most intriguing and optimal solution

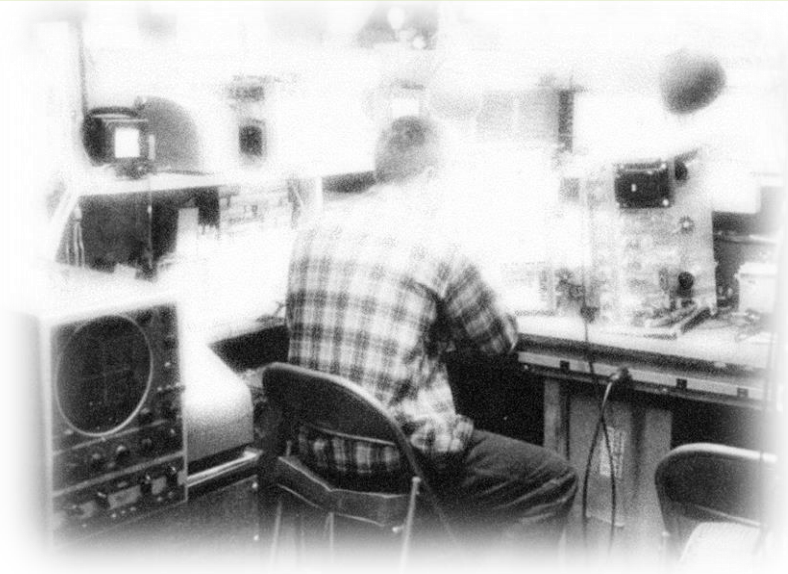


Demystifying creativity

- Ideation requires student to use their imagination and creativity.
- Creativity is the ability to go beyond existing ideas and create new ones.

Myth 1: Ideas are generated by lone **geniuses**

Myth 2: Ideas are generated by **lone** geniuses

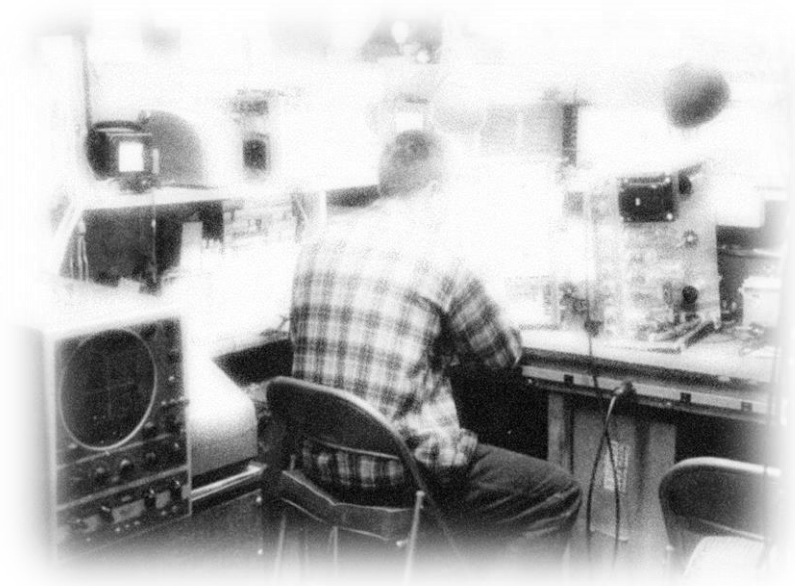


Did you think Thomas Edison sat alone in a garage and thought of solutions?

Demystifying creativity

Truth 1: With practice, anyone can generate good ideas

Truth 2: Good innovators also need a team! And need to stand on the shoulders of giants!



Thomas Edison worked with a team of 40 people in a large-scale research lab

the documentary, *Design & Thinking*, Kelley states that "design is a sport where you have to actually participate." If design is a sport then a designer should train like an athlete. Athletes train their bodies to build strength and agility, practicing their sports skills through hours of repetition to compete with fierce opponents. In the same way, designers need to work out their creativity through training and practice. In

Find the predecessor

Volunteer!

One student is to mention a modern day invention, others have to say what were its predecessors, and what theories had to be in place for the invention to come about

IDEO – Shopping cart challenge

www.youtube.com/watch?v=M66ZU2PCIcM

PRINCIPLES

- One conversation at a time
- Stay focused
- Encourage wild ideas
- Defer judgment
- Build on the idea of others

Pre-Brainstorming: Mindset, Warm-ups

Before students engage in ideation, transition their mindset toward practical optimism. A positive-thinking mindset is especially important in the ideate phase. According to Donna Wilson and Marcus Conyers's book, *Teaching Students to Drive Their Brains*, it can improve motivation and productivity, but most importantly, enhance creativity and problem-solving.

- **Practical Optimism**: Positive thinking + Beneficial action = Good results
- Knowing that **getting stuck** is ok! (Activity of the circles)
- **Help improvise others' ideas:** Try not to say 'Yes, but'.. Try saying 'Yes, and'

Getting Stuck with 30 Circle Exercise

In his webinar, *Design Thinking: Training Yourself to Be More Creative*, Stanford professor Bill Burnett explains that creativity is a "high-energy brain behavior that is not normal for most brains." However, Burnett believes that creativity can be learned, and since it is a high-energy brain behavior, training is required for people to perceive the world as creatives do. One of the reasons why people fear activities that require creativity is because of their disdain toward the feeling of being stuck. This feeling of being stuck happens when people don't know what to do next, don't know what decisions to make, fail to meet a goal, or in the case of the ideate phase, can't think up creative ideas. Burnett suggests people should train themselves to get *stuck* so that their fear will decrease as they get more exposed to this type of situation.

Divergent thinking

- **Quantity better than Quality**: Do not try to fine tune your idea. Work on getting many ideas

- **Encourage wild ideas**: Initially it might look pointless, but with practice, you'll be surprised!

Building on ideas

- **Build by ‘plus’sing on ideas of others**: Do not use their ideas/ solutions as such. See how you can improve or customize them.

- **Share your opinions with others**: Use sticky notes (or such) to share your opinions

- **Getting unstuck:** Create subsidiary ‘how-might-we’ question or reframe problem statement.

Convergent thinking:

After accumulating a large quantity of ideas during the brainstorming session, students will start to analyze and evaluate their ideas, choosing the best ideas to move forward to the prototype phase. Through convergent thinking, students use their decision-making skills to choose multiple ideas that have the potential to bring drastic change, improvement, or resolution to the design challenge. Instead of going broad, this stage involves narrowing down to the best set of ideas for prototyping.

How to Choose the Best Ideas

- Most likely to make your user happy
- Most likely to work
- Most likely to be surprising/interesting for your user

Before submitting their blueprints for approval, I ask students to check for four things:

1. How does it benefit their end user and/or solve the problem statement?

2. In their opinion, how is their solution *cool*?

3. Is the solution buildable?

4. How is the solution going to be tested so that it can elicit feedback and be improved?

Convergent thinking:

- When you have enough ideas that appropriately addresses the problem statement, choose the best idea
- **Criteria:** Most likely to make user happy. Most likely to work. Most likely to be interesting.
- **Getting unstuck:** Create subsidiary ‘how-might-we’ question or reframe problem statement.

Make a blueprint

- Can be technical drawings or strategic plan, a website, a flow chart, a story board, or so on.

Take home activity

- In a sheet (for submission) write down different ideas for DIY mechanical games inspired by video games. Then converge to one idea and bring a blue print.

https://youtu.be/BWFtC0GKWf0

Prototype Phase

- Students take their ideas and make them a reality, producing a prototype – an experimental model – that the end user can experience.

prototype is a working model of combined ideas from the ideate phase, based on what students learned from the users. Created, altered, and in some cases, inspired by previous prototypes, this prototype will ultimately result in the final product.

Few critical goals during prototyping:

- Communicate clearly how the solution will solve the problem
- Test, elicit feedback, identify new insights, and find unexpected failure points that can lead to improvements and refinements
- Provide opportunities to problem-solve and think through ideas that may arise through the act of making

Few RULES during prototyping:

- Do not get attached to your prototype
- Do not consume too much time for making a prototype

Prototype Phase – Rapid prototyping

- Create low-resolution prototype, and create it quickly
- This enables you to gain feedback and learn failure points by building multiple prototypes

Example: Design of foot stools





- Students used small pieces of felt, cardboard, and pipe cleaners to construct miniature model that were about two to three inches tall.

- Felt is a kind of cloth made by rolling and pressing wool or another suitable textile accompanied by the application of moisture or heat, which causes the constituent fibres to mat together to create a smooth surface.

- Students can explain the feature of each footstool model. Students used additional information to start a new prototype that combined the strengths of each of the previous models .

Google Glass: Ideas for Rapid Prototyping

A great example of rapid prototyping that you can show your students is Google's development of Google Glass, a sleek, futuristic pair of glasses with an optical head-mounted display that allows users to operate apps through voice activation and has the capability to take photos and record video in an actual first-person point of view.

Prototype Phase – Rapid prototyping

- https://youtu.be/d5_h1VuwD6g

- TedYouth presentation, 2012 – Tom Chi, The co-founder of X

- Chi's three rules for prototyping

1. Find the quickest path to experience.
2. Doing is the best kind of thinking.
3. Use materials that move at the speed of thought to maximize your rate of learning.

Finally: How would you think about the general shape/size?

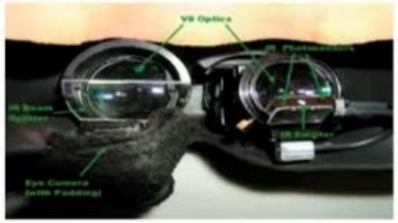









The optical appliance "mobile Eye-Trek (Keigan)" Wireless HMD prototyped by Olympus.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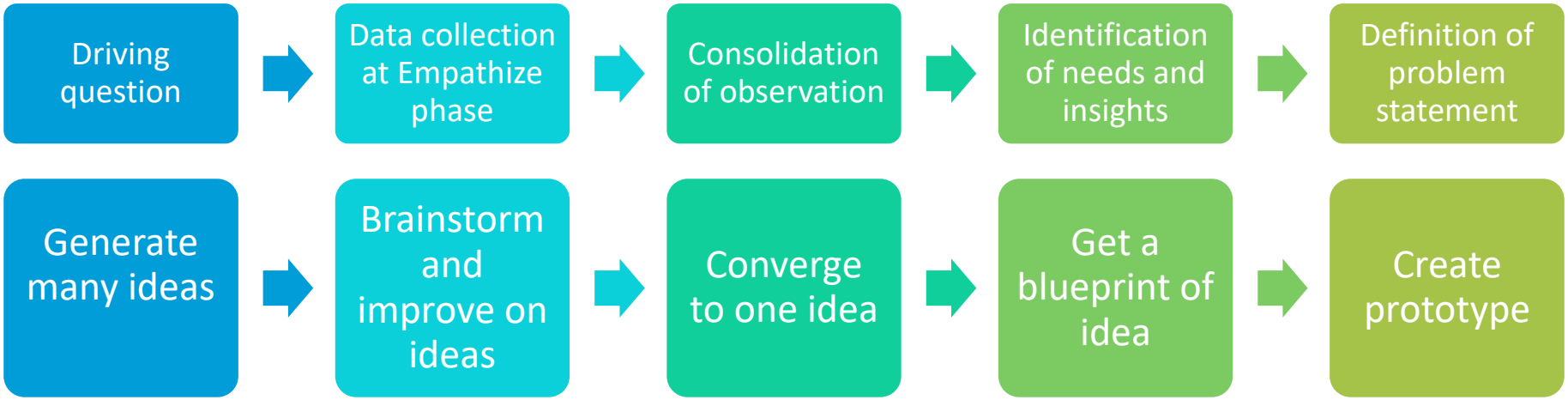
that have built various systems like this,

Prototype Phase – Prototyping in action



1. Decide on materials and tools
2. Decide on what user experience you are testing
3. Design control parameters and failure tests

design a solution (manufactured product, strategic plan, media content, etc.) that would help reduce the impact of environmental problems caused by human activity.

students created biodegradable bioplastic to replace petroleum-based plastics used for everyday items, portable solar cookers to reduce the use of nonrenewable resources for heating, a vermicompost home kit that decomposes food waste to create fertilizer for backyard gardens, and a dew water collector for regions with frequent droughts. Not all the solutions students designed were tangible objects. Students also created the likes of a website to bring awareness to an environmental issue and educate people on how they can help

1. Solar-powered boat that captures floating plastic in the ocean

2. System that filters garbage pollution for urban runoff with the capability of easy garbage removal

3. Toilet system where water used from the sink is transferred to the toilet to be reused.

4. Car tunnel that incorporates trees to remove CO2 inside the tunnel, and includes a rainwater irrigation system and solar powered artificial lighting.

5. Tram system that is powered by the steam created by the water being heated by geothermal energy

6. Farming system that reuses water, prevents erosion, and does not use pesticide for its crops

7. Product that limits the movement of faucet handles to reduce the amount of waterflow

Facilitation and Mentorship

Complex projects can be challenging for both students and teachers because of the rigor and continuous inquiry they require. For that reason, it is important for a number of passionate educators from different disciplinary backgrounds to facilitate students throughout the DT process, especially in the prototype and testing phases.

Prototype Phase – Facilitation and Mentorship

- Work in a team, and look for mentors who

1. Have time to spend with you
2. Are experts in the field
3. Are passionate about your problem statement
4. Has confidence in your design solution

Prototype Phase –Tools & materials

a. Hardware – Manufacturing tools, Electronic components, Wood/ plastic/ other materials

b. Software – Microcontroller programming, 3D design software

c. Remember safety is paramount! Cost restriction is practical!

Prototype Phase –Tools & materials

a. 3D printing - https://youtu.be/-TDn25K-Jh4

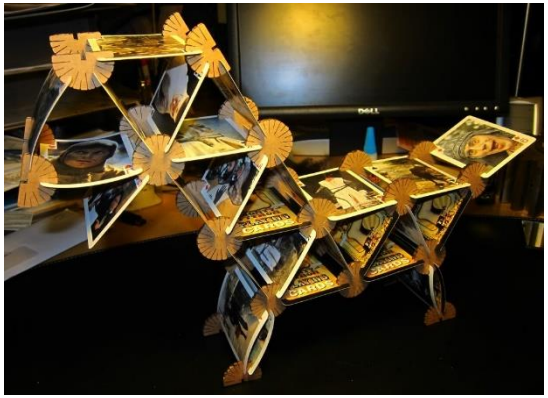
b. User Interface designing - https://youtu.be/1c9LsuN3zVY

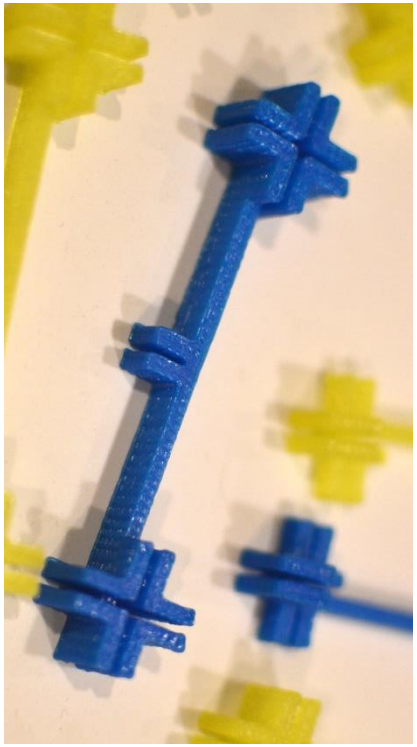
c. Electronics prototyping - https://youtu.be/HUVbGxMgu3E

d. Arduino for prototyping

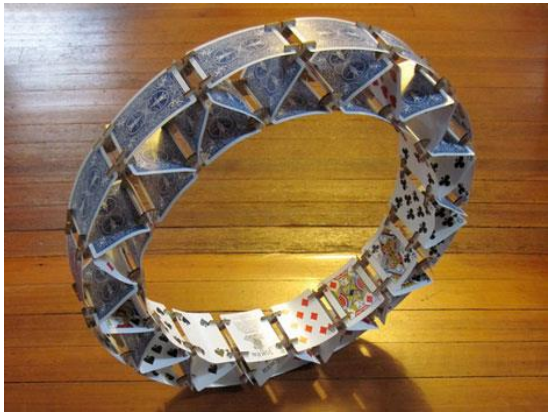
Prototype Phase –Activity

- Don’t make any changes in the card. Design and prototype a connector and make 10 pieces of it.





- In the next class we’ll test whose design is best by having a competition



Name:

USN:

Email:

Mobile:

Title:

Field:

Introduction:

Literature Survey:

Problem Definition/Statement:

Existing Outcomes:

Probable/ Real time outcomes:

References:

- **References:**
- **David Lee, Design Thinking in the Classroom, Ulysses Press, Korea, 2018**

Thank You…

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