Session 15

Develop It!

Prototyping

In This Session:

A) Prototype Work Session
    (150 minutes)
    - Student Handout

Student designers' ideas take on new forms as they develop their prototypes. These should be working prototypes with full functionality. Of course, students may find that as they refine and test their ideas they develop several working prototypes. This session has one activity, *15A: Prototype Work Session*, devoted to prototype development.

Supplies

Materials to demonstrate what may be used in prototypes:

- Wood
- Foam
- Plexiglass
- Metal
- Canvas fabric
- Bubble packing
- Cotton balls
- Duct tape
- Tubing
- Sandpaper
- Sponges
- Steel wool pads
- String or twine
- Glue
- Masking tape

Tools

- Several sets of each: pliers, saw, hammer, screwdriver, hot glue gun, and tin snips

Session 15, Activity A
Prototype Work Session

Goal
Learn how to develop a working prototype.

Outcome
Build a working, fully functional prototype.

Description
Students work on their prototypes of the project. Be sure to have them keep records to document their progress. Encourage a culture of experimentation. The goal is not to get the prototype done, but to try out different ways that the product could work and find the best solution. Mentors should be available to assist with the development of prototypes.

Supplies
Materials to demonstrate what may be used in prototypes:
- Wood
- Foam
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Tools
Several sets of each: pliers, saw, hammer, screwdriver, hot glue gun, and tin snips

Preparation
None

15A: Prototype Work Session (continued)

Procedures
Debrief Home Improvement

1. Check in with students to review their calendar from the Home Improvement activity in Session 14.
2. Show samples of students' schedules.

Work session

1. Discuss the purpose of a prototype. Refer back to the purposes from *14A: Prototype Planning*: learning, communication, integration, and milestones. Be sure to emphasize that prototypes are still part of the experimental stage.
2. Remind students that they are wearing two hats: that of an engineer and that of a designer. As an engineer, they should be sure that the prototype demonstrates that the product is feasible, possible, manufacturable, and cost-effective. As a designer, they should keep in mind the idea of user-centered design and continue to ask: Is it useful, usable, and desirable?
3. Have them take out their design specifications from *14A Handout: Prototype Planning* so that they can use the specs when developing their prototypes.
4. Reiterate the value of good records as they develop their prototypes. Remind them that they need to take the time to be methodical and write down what they plan to do and why.
5. Discuss the value of testing and data gathering. Give examples of kinds of testing and how to be systematic. For example, stress and load testing on straps. This can be done by adding successive weights to measure up to specifications. Determine how much weight the strap can hold.
6. Clean up and organize storage or transport of prototypes home for further work.

Wrap Up
Have each junior engineer stand up and show what he or she developed so far and state what he or she is planning to do next.

Follow With
In Session 16, *Test It!*, students develop the next stages of the project.

Prototype Work Session
Handout: Session 15, Activity A

It is helpful to keep good records of your prototyping efforts. Good records allow you to adjust your design based on what you learn from each step of the process. The questions below can help with this record keeping.

Plans
How do you plan to build your prototype

Purpose
What will this prototype be able to do?

Testing
Will the prototype meet your specifications? How will you test this and what data will you gather?

Next Steps
What do you want to do next? Adjust this prototype? Build another version of this prototype?