

TIDEE

Transferable Integrated Design Engineering Education



UNIT 4: Multi-week Engineering Design Project

Session 4: Select Design and Plan Construction

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Announcements and Objectives for the Day (10 minutes)

- a. Teams select their prototype and continue developing its design during class
- b. Develop a construction Gantt chart
- c. Individual team members know and accept responsibilities for construction of team's human powered paper vehicle

Selection of Design (15 minutes)

Complete Design Details (40 minutes)

Create Construction Timeline (22 minutes)

Reflectors Report*

*See previous activity for instructions

Session Overview

In this fourth session, a process is presented on how to make a decision based upon criteria, rather than emotion. During the previous session each team made several revisions of the criteria that should be used to make the selection. Based upon these results, each team ranks the importance of the criteria relative to the project's needs. Afterwards, these criteria are used to select one design (out of the three conceptualized) to be developed further. Notice that the selection process is done several days after the ideas were generated and the components were developed. After the design is selected, your team focuses on developing individual components that make up the whole of your design.

Tree diagrams and time/task analysis (Gantt charts) are introduced as project management tools. You will work through an activity that helps your team identify construction issues and results in developing a construction timeline. By the end of this activity you will be able to identify:

- the elements in a tree or fishbone diagram
- the construction tools needed and their availability
- the time for each action to be done
- the team member responsible for each of the actions

Teams use this material to plan how they will execute the construction of their project.

Activity: Selection of Design

Objective: To decide which prototype design should become the primary design to become the focus of further development

Tasks

1. Review criteria established from previous activity *Refine Design Criteria and Timeline*.
2. Add additional criteria to list as needed.
3. Establish the final criteria for selecting a design.
4. Discusses merits of each criterion and rank the items from most to least importance.
5. Record information on decision matrix provided.
6. Assign a weighting factor to each criterion. The system chosen should contain no more than five values, like 1 through 5.
7. Team reaches a consensus as to their first and second choices.
8. Team proceeds to the next activity *Complete Design Details* to continue the development of the team's first choice.

Deliverables

Team recorder records team deliberations, results, and pros and cons why the first and second choices were chosen.

Criteria for Success

- Consensus is reached in a positive manner.
- Team members effectively use selection criteria information previously determined.
- Team members are ready to support their team's consensus.

Resources

- Twelve minutes of team activity.
- Worksheet: Selection of Design.
- Results from previous activity *Refine Design Criteria and Timeline*.
- Team members experience in making decisions.

WORKSHEET: SELECTION OF PROTOTYPE DESIGN

Human Powered Paper Vehicle Design

<i>Criteria</i>										

Activity: Complete Design Details

Objective: To develop the parts that contributes to the whole structure

Tasks

1. Begin to design individual components for your team's first choice.
2. Establish criteria (a problem definition) that would be needed to find a creative and effective design for each part. Consider items like strength, ease of construction, availability and effective use of materials, how they will interface with other parts, etc.
3. Begin to develop each subsystem and draw upon previously developed resources.
4. Prepare a progress report that includes some sketches of the work in progress so that a construction plan can be developed during the next activity.

Deliverables

Team reporter prepared to briefly discuss work in progress for conceptual design and the development of individual components.

Criteria for Success

- The design is effectively broken into components that can be solved separately.
- Teams display a lot of synergy.
- Components are developed enough to create a construction timeline.

Resources

- Previous work on project.
- Thirty five-minutes of time.

Activity: Create Construction Timeline

Objective: To develop a plan for constructing the human powered paper vehicle

Tasks

1. Review the progress that your team has made in developing your human powered paper vehicle.
2. Decide what parts must be assembled and manufactured during the construction phase.
3. Develop a tree diagram that illustrates the order at which pieces must be added or developed during the process.
4. Prepare a list of construction tools and availability that will be needed to complete each process. If not, then what?
5. Estimate how long each construction action will take.
6. Develop a Gantt chart that illustrates how your team will effectively use the time allotted between now and race day.
7. Decide who is responsible for each of the action items and identify completion date.

Deliverables

- Team recorder must record acceptable Gantt chart in team journal before construction begins.
- Team reflector prepared to give a brief report that describes the difficulties encountered in developing a Gantt chart and what the team did to solve the issue.

Criteria for Success

- Each team develops an effective Gantt chart.
- Team is ready to finish building a prototype.
- Individual team members have accepted responsibilities to carry out a plan of action to construct their human powered paper vehicle.

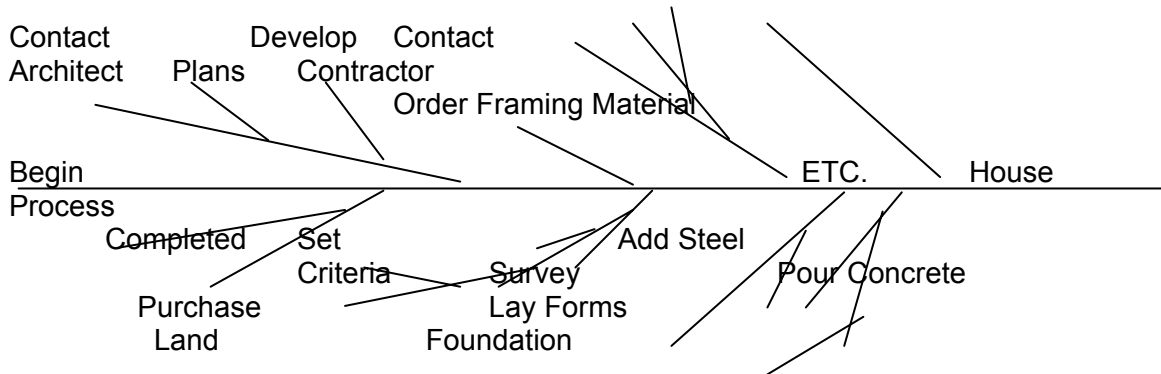
Resources

- Previous work on project.
- Eighteen-minutes of time.
- Handout Tree Diagrams and Time Line Charts and text material on Gantt charts.

Tree Diagrams and Time Line Charts

Tree Diagrams and Time Line Charts are useful tools to help create a plan of action. A tree diagram identifies procedures or work to be performed and how they relate to each other. The time line describes how long it will take to do a job, who is responsible for performing the job, and approximately when in the sequence the job needs to be performed.

An example of a tree diagram is shown below for the initial stages in building of a house.



For example, a person must establish the criteria for purchasing land. Do they want to be in the country, have a view property, or live in a high-density condominium development? Once the property has been purchased then an architect may be contacted if a custom home rather than a set plan is desired.

The architect may suggest to the owner a general contractor who can do the job. Decisions are made and eventually it will be time to lay the foundation. You add this to the tree diagram before the framing and finishing. So it becomes important where you add the branches to the trees.

Once the items are identified and placed in a rough sequence on a tree diagram, then it is possible to develop a more refined time line process.