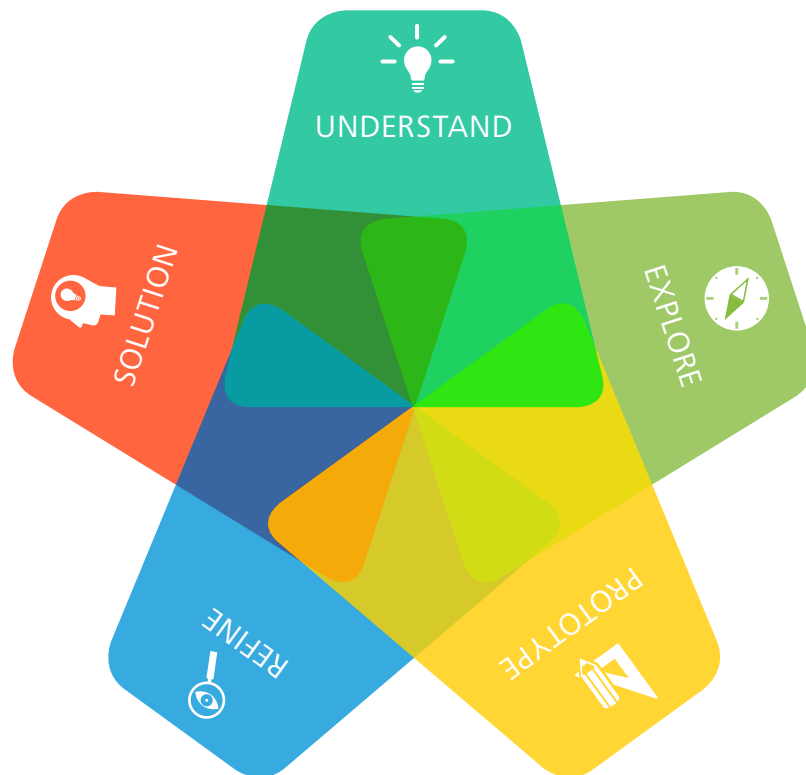


# Design Thinking: Prototype Phase Student Assignment

---

# Design Thinking Overview



## UNDERSTAND

The first stage of design thinking involves learning as much as you can about the problem at hand. What are the parameters? Who is the audience? Ask questions and brainstorm!



## EXPLORE

Next, do some research. Explore the many different ways people have tackled similar design challenges. Think about what's possible, as well as what might be some restrictions.



## PROTOTYPE

Once you have some ideas, it's time to test them. Sketch, write, mold, and use software to model your ideas as best you can. Try to communicate your concept as best you can.



## REFINE

By this point, you should narrow your field of ideas down to one. Use your prototype, your knowledge of the design challenge, and the power of design software to make final refinements.



## SOLUTION

Lastly, finalize your project the same way real world design professionals do every single day. Build it, print it, or present a broad overview of the finished product to your classmates.

# Overview

Design thinkers are proficient in more than design only. Our competencies and collaboration glide from business and marketing strategy to research to content strategy, and more. We're expert problem solvers, hail from a variety of disciplines (outside of design) and leverage cross-functional perspectives to excel and delight. This hands-on series is intended to help you learn the new skills required to excel as a design thinker today.

These assignments can be applied to product design, engineering, architecture, advertising, industrial design and more. They build class interaction, collaboration skills, peer-to-peer learning and foster a good environment.

In this design challenge, your goal is to design electric vehicle prototypes for a car model of your choice. This can be a family SUV, a sports car, luxury vehicle, a truck or something else, however it has meet the following criteria:

- Fit at least two people
- Include a small cargo area
- Use lightweight materials to increase efficiency
- Have an area large enough to hold batteries
- Include three different mechanisms that perform a basic function

To get started, download the Electric Vehicle project resources on Autodesk Design Academy, [academy.autodesk.com/curriculum/electric-vehicle](https://academy.autodesk.com/curriculum/electric-vehicle).

## LEARNING OBJECTIVES

### TIME

1-15 HOURS per level

### LEVEL

Beg/Int/Adv

### PREREQUISITE

Watch Alex Hammel, a Project Lead the Way Engineering teacher, shares his approach to design and prototyping using the design thinking process. This Designer Profile video is found at:

[academy.autodesk.com/curriculum/electric-vehicle](https://academy.autodesk.com/curriculum/electric-vehicle).



01

Demonstrate knowledge of prototype development.

02

Explain various approaches to developing a prototype.

03

Apply basic knowledge and skills of 3D modeling software to create a digital prototype.

04

Leverage Design Academy resources to introduce educator/students to design thinking principles through foundation exercises and projects.

05

Extend teacher/student networks through participation in the Design Academy community and with the homework assignments that accompany the article.

## DESIGN BRIEF: BEGINNER

In this assignment, you create a prototype of your electric vehicle car using Fusion 360. You leverage the Fusion How to Video resources on Design Academy ([academy.autodesk.com/software/fusion-360](http://academy.autodesk.com/software/fusion-360)). During the process, remember to solicit feedback on your design to improve your design in the next stage of prototype development, the refine stage.

TIME: 5-10 HOURS

### STEP 1:

Explore the electric vehicle possibilities that exist today and identify what people in your target audience need and want. Then familiarize yourself with current electric vehicles, hybrids, battery powered and alternative energy solutions to get inspired and find opportunities. Consider available technologies and light weight materials.

### STEP 2:

List what you don't know – for instance, how big does the interior need to be to hold two people comfortably? Then find out.

### STEP 3:

Begin to sketch either by hand or with Sketchbook. This Design Academy project [link to <http://academy.autodesk.com/curriculum/concept-sketching>] offers ideas on how to create successful sketches. Whether sketching by hand or in Sketchbook, you'll want to set a timer for 5-10 minutes to ensure your sketches are simply quick renditions of your initial thinking in concept form. Include visuals and notations to help clarify your ideas. NOTE: All hand sketches should be in black and white only. Repeat this exercise three times to yield three different 5-10-minute concept sketches.

### STEP 4:

Solicit feedback from 5-7 people. Include a mix of classmates, friends, family and people who fall into your target audience. Plan for at least a 20-minute discussion with each person.

Write a simple script that includes the following:

- One to two sentence overview of what you're trying to accomplish.
- A quick overview of what you are seeking feedback on and why.
- Request both positive and negative critique.
- Remind them there is no bad feedback!
- Share the concepts individually.
- Solicit input on each version, including what they like and why, what they don't like, and why.
- Solicit input about their preference for shape and "must have" and "nice to have" criteria.
- If you are meeting in-person, consider giving them a marker and asking them to make revisions to the drawings directly (NOTE: Make sure you bring copies of your originals, do not have them write on your originals)
- End the discussion asking if there is anything else they think would be helpful for you to know or consider to make these

concepts more feasible and desirable.

- Make sure to thank them for their time.

Be sure to record your conversation on your smartphone or a recorder if you have one AND take notes during the discussions. Better yet, have a friend take notes for you so you can be 100% present for the interview. After each interview, write down the most important findings. It's key to do this after each discussion, and not at the end of all of the conversations, because you will forget and the feedback will start to blur together.

### STEP 5:

Compile your learnings, identify the gaps and patterns from the feedback, and make a list of the improvements that would enhance the prototypes in a future iteration.

### STEP 6:

Apply the above learnings to your next round of prototypes. Use Fusion 360 to sculpt the three concept into higher-fidelity prototypes using simple push-pull commands to render the right shapes. Use the How to Fusion tutorials ([academy.autodesk.com/software/fusion-360](http://academy.autodesk.com/software/fusion-360)) to get you started.

### STEP 7:

Repeat steps 4 and 5. Share your Fusion 360 renderings with your peers and the target audience to get feedback. Ask what they like and don't like, dig into more nuanced areas, and document your findings.

## DESIGN BRIEF: INTERMEDIATE

In this assignment, you create a prototype of your electric vehicle car using Fusion 360. You apply various workflow approaches to generate your design intent and develop a 3D model of your prototype. Reference the Fusion 360 How to videos on Design Academy ([academy.autodesk.com/software/fusion-360](https://academy.autodesk.com/software/fusion-360)) to get started and remember to solicit feedback on your design to apply to your next round of prototypes.

TIME: 5-10 HOURS

Now that you're familiar with Fusion 360 and have applied the basic sketching skills, complete the beginner's exercise above and add in one or both of the following additions:

### STEP 1:

Create the body using a freeform design approach by adding a T-spline body and placing the T-spline in the design and editing using features such as symmetry, faces, edges, or materials editor. Compile the new round of prototypes with this additional detail to take these to a higher level of fidelity.

### STEP 2:

Repeat STEPS 4 and 5 in the Beginner level. Conduct another series of interviews to get user feedback on the second round of your prototypes.

### STEP 3:

Write 500 words about what worked and didn't work in your rapid prototyping experience. Describe what you learned from working quickly, hand sketching in black and white, and hearing feedback from users. Conclude with lessons you learned, how you may approach this differently in the future, and a summary of next steps to take your ideas to the next level.

## DESIGN BRIEF: ADVANCED

In this assignment, you create a prototype of your electric vehicle car using Fusion 360. You apply various workflow approaches to generate your design intent and develop a 3D model of your prototype. You further your knowledge of Fusion 360, applying advanced level skills to generate and render your 3D model.

TIME: 5-10 HOURS

### STEP 1:

Review the beginner and intermediate activities and complete both of them.

### STEP 2:

Compile one new prototype based on the feedback you received. Add in more detail to take this round to a higher level of fidelity by turning your sketch into a model. Check out the the “How to” Fusion 360 tutorial videos on Design Academy: [academy.autodesk.com/software/fusion-360](https://academy.autodesk.com/software/fusion-360), to master Fusion 360 software skills. Explore at least two ways to model (parametric, direct, surface, surface or freeform modeling).

### STEP 3:

Conduct another series of interviews to get user feedback on the second round of your prototypes.

### STEP 4:

Write 500 words about what worked and didn't work in your rapid prototyping experience. Describe what you learned from working quickly, hand sketching in black and white, and hearing feedback from users. Conclude with lessons you learned, how you may approach this differently in the future, and a summary of next steps to take your ideas to the next level

### STEP 5:

Share you final Fusion 360 rendered model with our global design community of students and educators on the Design Academy Portfolio page at [academy.autodesk.com/portfolios](https://academy.autodesk.com/portfolios).