

Student Name: **Stu Dent**

Date: **Today, This Year**

Project Title: **The kScooter – a Solar Powered Kid Scooter**

The initial steps to generate an engineering project are listed as questions in the boxes. By thoroughly answering these prompts, students will have a well-defined project that is ready to apply for the Synopsys Championship.

Background: Give a brief description of why you want to use your topic as the foundation for an engineering project.

I like to build things using gas motors. I wanted to build a scooter for myself, but my allowance isn't high enough to buy gasoline. I thought I'd solve that problem by trying to make something with solar power.

Engineering Goal: The engineering project goal should be described in a simple statement that includes what you are designing (the product), who it is for (customer), and what need does it satisfy (problem to solve). Also list the technical content of your project and how your project improves previous designs (easier to use, less expensive, more efficient, safer to use, etc).

My Engineering Goal Statement: The design and construction of a solar powered scooter for kids like me to zip around the block.

The technical content of my project includes capturing solar energy, storing this energy, motor torque, mechanical gear ratios, and electronics. My project is different than current designs because it will be built for kids. It will be simpler than an adult scooter. It won't have to go that fast and only has to move a light body.

Design Criteria and Constraints: Criteria define the product's physical and functional characteristics (shape, size, weight, speed, ruggedness, and ease of manufacture). Constraints are factors that limit the engineer's flexibility (cost, time, and knowledge, legal issues, natural factors such as topography, climate, raw materials, and where the product will be used). Please list the criteria and constraints that your project must satisfy.

My scooter project must:

1. Transport a rider weighing up to 35 kg
2. Get to a speed of at least 8 kph on level surfaces
3. Must travel through 10 meters of shade
4. Battery life must allow me a 30 minute ride.
5. All material costs need to be < \$50
6. All Testing completed by Feb 28

Evaluate alternative designs: Your research into possible solutions to a defined problem will reveal what has already been done by others to satisfy similar needs. You should consider at least two or three alternative designs and consider using available technology, modifying current designs, or inventing new solutions.

My solar powered scooter is for riders weighing up to 35kg. Many on the web are for adults and those scooters require more energy than a scooter made for a kid. For example, the photovoltaic (PV) cells themselves don't need to be super huge or super heavy. Also, the engine can be smaller and lighter and provide less torque. I can use some of their design techniques (fold up PV cell panels) but everything can be made smaller and simpler. Here are some pictures of 'adult' solar scooters. My vision is for a cheap, light, low performance scooter.



How will you Test your project? Be sure to measure test results against your design criteria to show how well the product meets the engineering goal. Develop a test plan describing what you will test, how you will test, and how you'll perform analysis. You must test your prototype under actual or simulated operating conditions.

I will test my scooter against the 'Criteria and Constraints' listed above. Once the prototype is built, here is how I will test it.

1. Transport up to 35 kg rider.
 - a. Test Description: I weigh 35kg. After fully charging up the battery and with my bike helmet secured, I will ride the scooter on a deserted, level surface. The scooter must move easily (defined below) on a level surface.
2. Speed of at least 8 kph on level surfaces
 - a. Test Description: I will fully charge up the battery and ride the scooter on a deserted, flat surface. I will time how long it takes me to ride 25 meters. 8 kph takes 11.25 seconds.
 - b. Exceeds Test Description: I will measure the time it takes to travel 25 meters with different mass loads. My mass is 35kg, and I will carry different weights to also generate data with loads totaling 40kg, 45kg, 50kg, and 55kg.
3. Travels through 10 meters of shade

- a. Test Description: I will fully charge up the battery and ride the scooter on a flat surface that is totally in the shade. I must travel at least 10 meters.
 - b. Exceeds Test Description: Using the same shade setup, I will measure the total distance I can travel in complete shade. I will make the same distance measurements with different mass loads of 40kg, 45kg, 50kg, and 55kg.
4. Battery life must last at least 30 minutes.
- a. Test Description: I will fully charge up the battery and ride the scooter on a flat surface. I will measure the total time I can travel without stopping to charge the battery. I must travel for at least 30 minutes.
 - b. Exceeds Test Description: Using the same riding course, I will measure the total time I can travel without stopping to charge the battery. I will make the same elapsed time measurements with different mass loads of 40kg, 45kg, 50kg, and 55kg.
5. Material cost is < \$50
- a. Test Description: Keep a log of how much is spent on every item used in the project experiment, along with date, vendor, and detailed part description.
 - b. Exceeds Test Description: In addition to the log mentioned above, include alternative prices and vendors that were evaluated.
6. All Testing completed by Feb 28
- a. Completion by this date will allow enough time to generate a well thought-out display board. I know that engineering judges enjoy a neat presentation using bullet points, applicable data, and correctly labeled, metric based graphs.

Start a project notebook. All engineering project ideas should be documented in a notebook. This includes initial brainstorming, sketches, pasted articles and photos, investigations of alternative designs, construction diagrams, potential electrical circuits, etc. All pages should be numbered and dated in ink.

The construction diagrams and potential electrical circuits should be included in the submitted application.

I have already started a detailed project notebook. I am writing down all my ideas and plans. Every page is dated and written in ink. The construction diagrams and electrical circuits are attached to the application

Bibliography. Keep track of your references and include at least three references in your application.

My bibliography is attached to the application.