Sun-Powered Cars

Material Properties, Circuits, Force and Motion (Weight, Momentum, Speed, Torque, Friction), Angles, Relationship of the Sun and Earth, Axis, Seasons

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Description

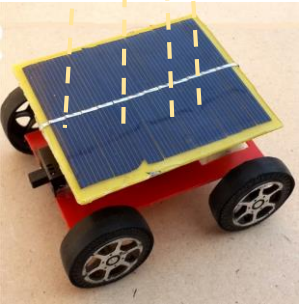
Solar Powered Cars are a fun engineering design challenge that provide plenty of room for academic conversations. The reality of solar panels is they aren't perfect by any means. They require a level of precision in their positioning to the sun that producing a successful device is a challenge! Therein lies the opportunity for exploration, inquiry and iteration as both students and teachers alike can grow academically with the creation of a solar-powered car.

The two prototypes developed for this activity are designed to serve as an exploration of what the introduction of a 3D printer and some simple design software can produce as well as an how this project can be completed using more common classroom materials such as popsicle sticks and hot glue. Either approach can provides obstacles but both can be a rewarding endeavor. Examples of these obstacles and learning opportunities are highlighted on the following page.

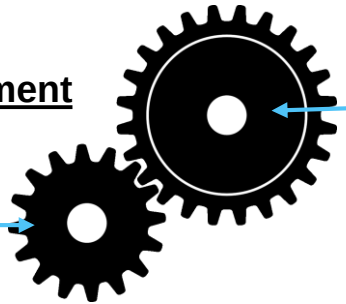
While designing and building a solar powered car is fun and challenging task that would serve any classroom well as an enrichment opportunity or problem-based learning unit. The design and building may be more of a challenge than some teachers feel comfortable with, however a single solar powered car (teacher-created) could serve well as a discrepant event or inquiry prompt to get students thinking bigger about the relationship of our sun and planet.

Lessons Learned

1. Solar panels may claim to achieve a certain level of current (electricity) but often times that is under ideal conditions, reality is a much different story. The angle of the sun in relation to the solar panel is challenging, build the panel parallel to the ground and your car runs great on a sunny clear summer day at 12:00 pm. Otherwise you lose significant light and current production with just the slightest angle in the relationship between the sun and solar panel, even the seasons and your geographic location can play a role in this.
2. Weight of the vehicle is a large factor when utilizing toy motors, gears, axles and wheels as I have. The 3D printed chassis is extremely heavy in comparison to the popsicle frame and it shows in the performance of the vehicle.
3. Gearing your car is fairly simple step; larger gear on the motor with smaller gear on axle creates faster revolutions of the axle/wheels. Smaller gear on the motor with larger gear on the axle creates more torque. I elected for the torque option to help move the weight of the vehicle and get a better start.



Torque Arrangement



Suggested Materials

Below are some recommended materials that could provide a foundation for your ideas and designs.

1. DIKAVS Gears, Wheels and Axles found on Amazon https://amzn.to/2xNocwn
2. Popsicle Sticks
3. BBQ Skewers
4. Plastic Pen Body (strip the pen apart and use the tube/body)
5. Electrical Switch (optional)
6. Wire
7. Hot Glue
8. Solder (optional)
9. NUZAMAS 6 Volt Solar Panels found on Amazon https://amzn.to/2xNYpEh
10. 3D printable frame and parts can be found here http://bit.ly/Harbor3D.

Version 1- Assembly

3D Printed Motor Mount, Chassis and Solar Cell Stand

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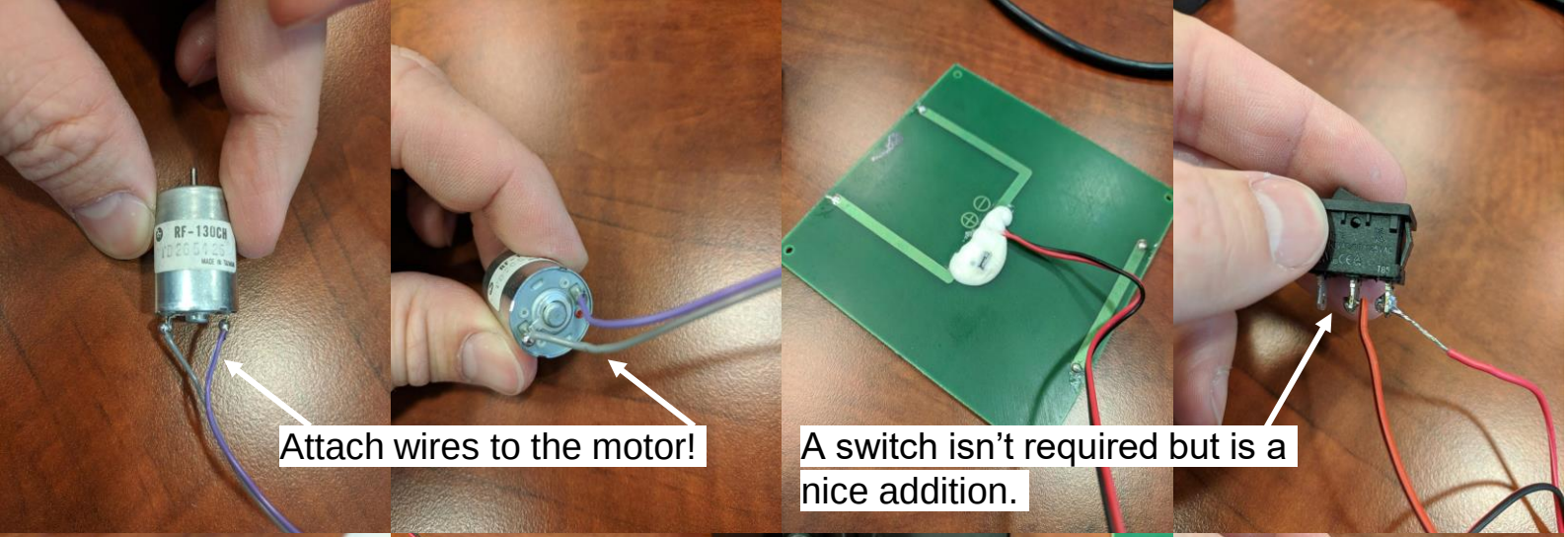
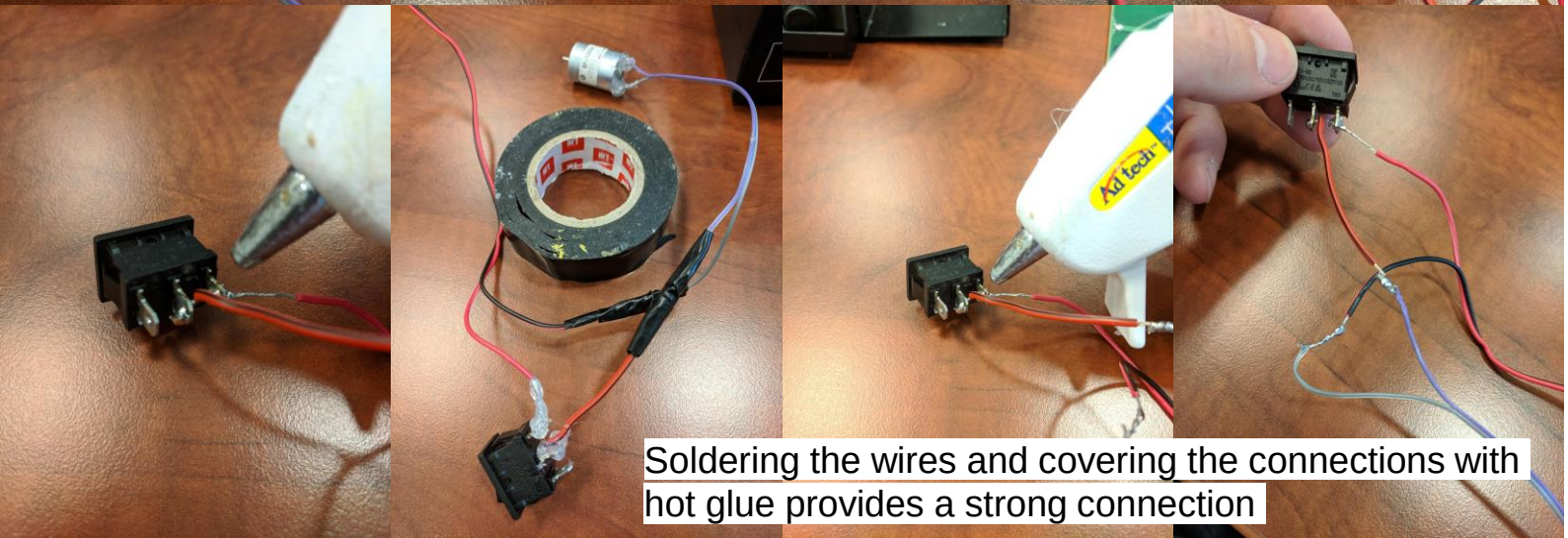
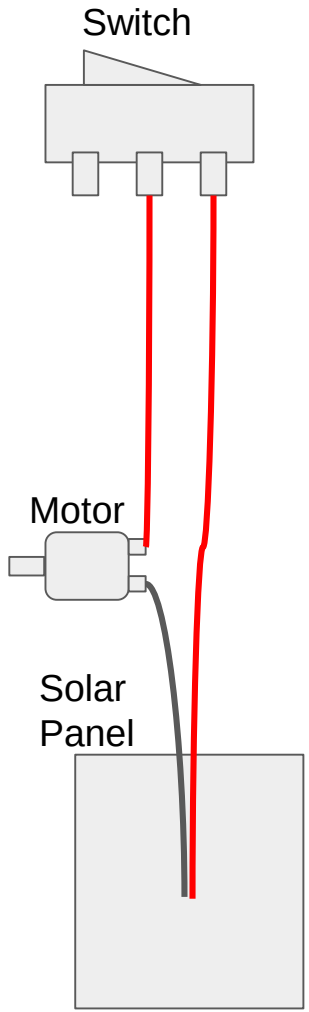
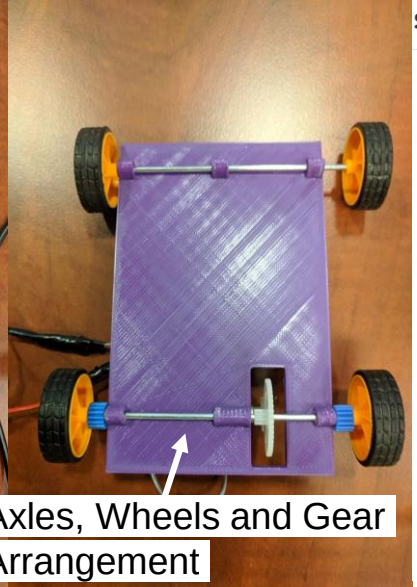

RF-130CH
Attach wires to the motor!
A switch isn't required but is a nice addition.


Soldering the wires and covering the connections with hot glue provides a strong connection

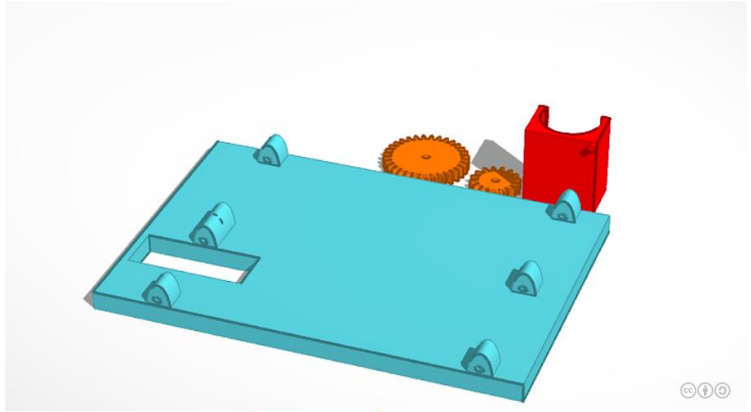

Switch
Motor
Solar Panel



Axles, Wheels and Gear Arrangement

Solar Panel Car Body and Gears

Like 0



design by:
Doug Thompson (677)

Edited 8/17/18, Created 8/16/18

Tinker this

3D Print

Download

View in 3D

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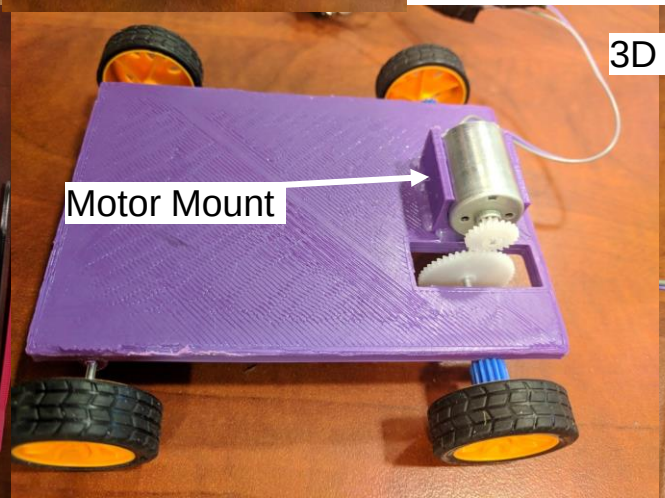
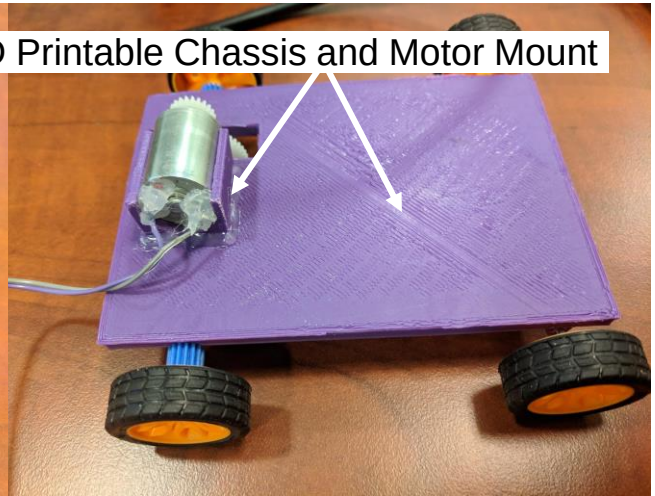
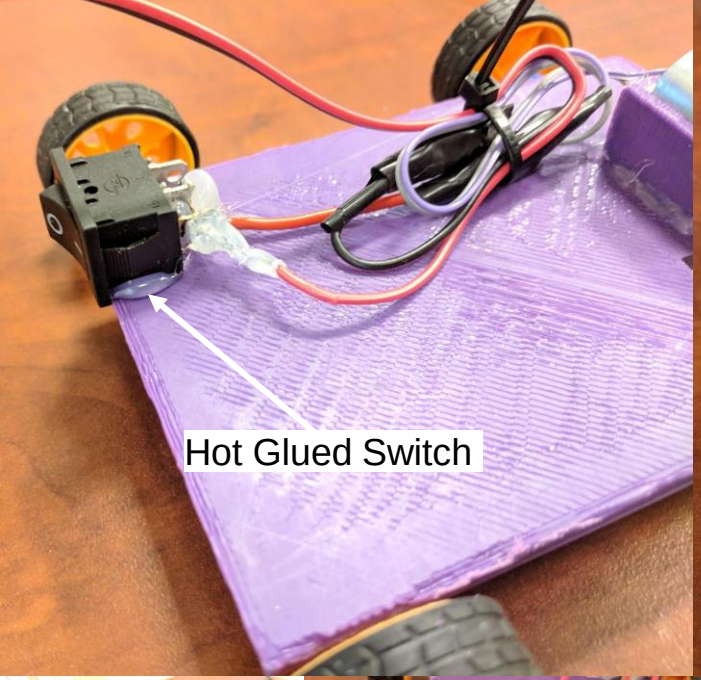
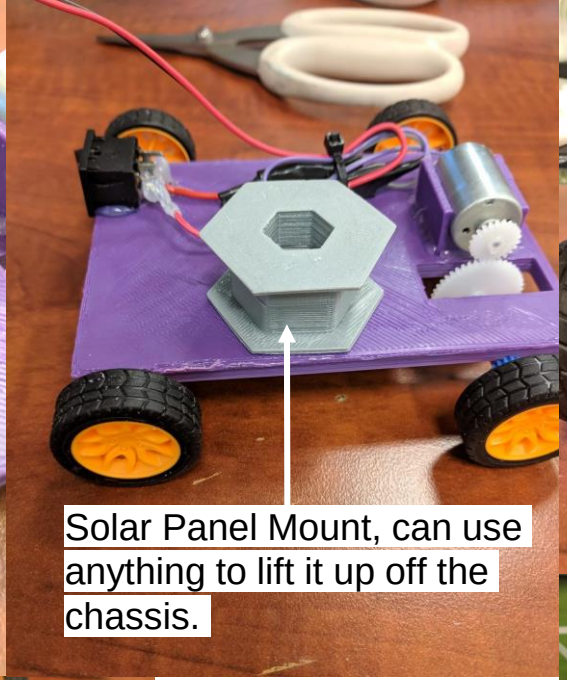


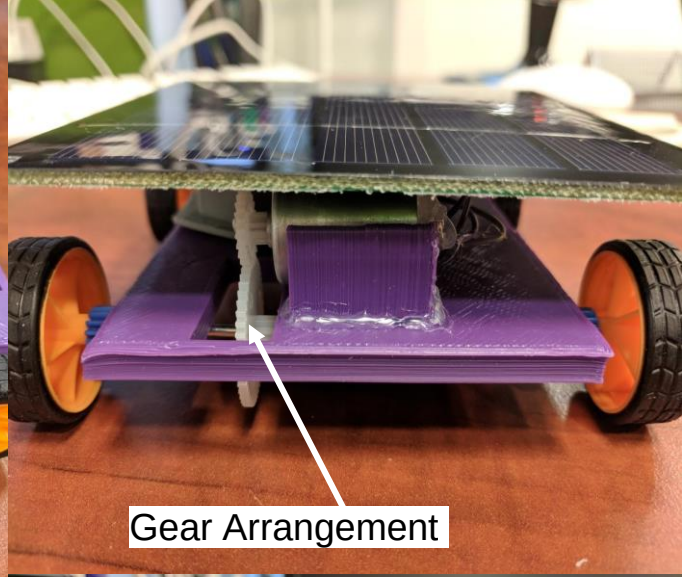
Motor Mount

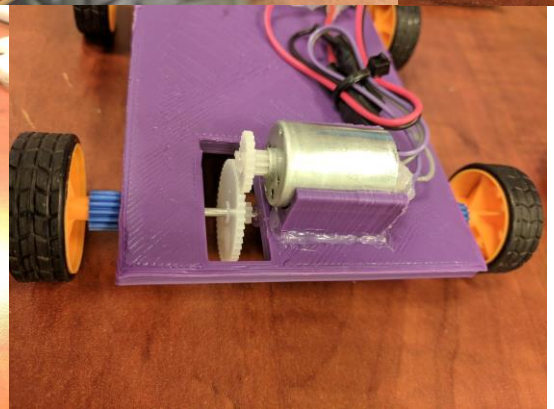


3D Printable Chassis and Motor Mount


Hot Glued Switch


Solar Panel Mount, can use anything to lift it up off the chassis.


Gear Arrangement



https://youtu.be/dctplGhbWCg
Sample Function Videos

https://youtu.be/RgZpyLS_h6U
Sample Function Videos

Version 2- Assembly

BBQ Skewers, Popsicle Sticks and Pen Cases

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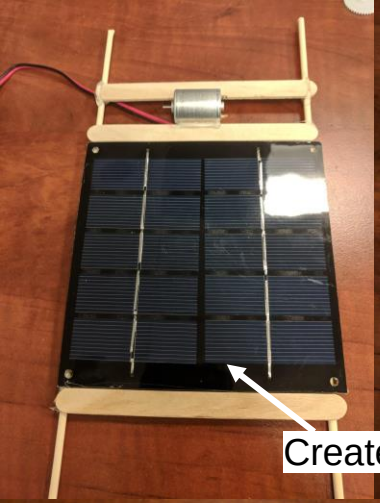
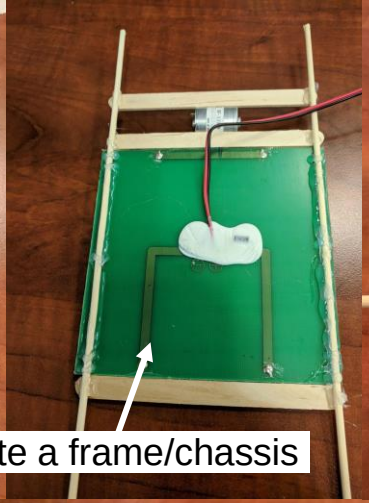
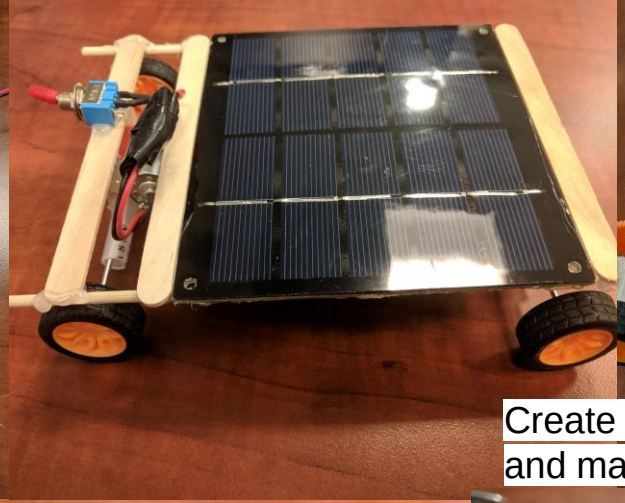
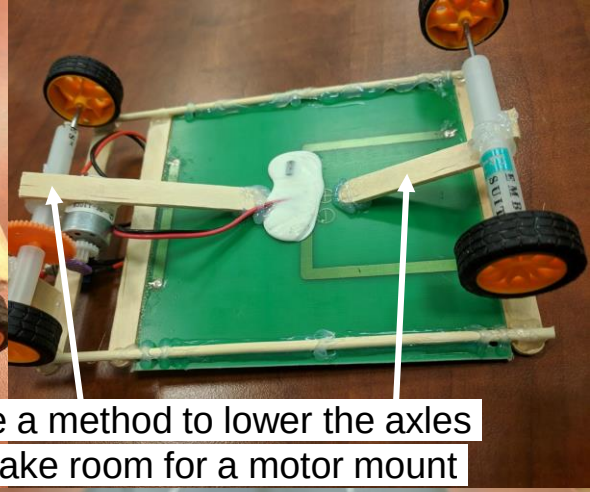


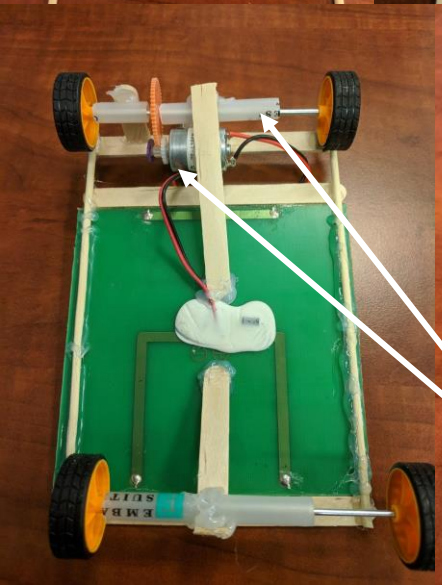


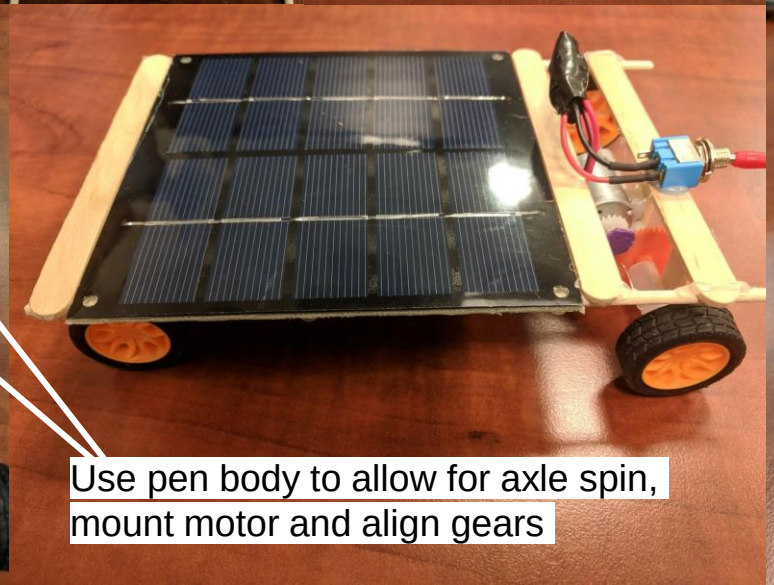
Create a frame/chassis



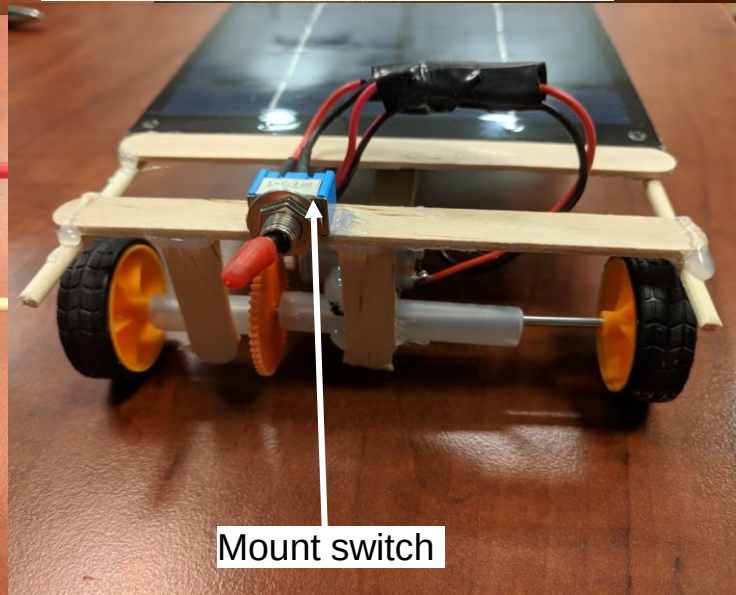


Create a method to lower the axles and make room for a motor mount





Use pen body to allow for axle spin, mount motor and align gears



Mount switch