

KidWind / Know Energy

VII. Wind Challenges

Types of challenges

- I. Competitive
- II. Non competitive

I. Competitive

1. Blade Design to produce electricity
2. Blade Design to achieve maximum lift
3. Blade and Gear challenge for electrical output
4. Blade, gear and generator challenge for electrical output
5. Free For All (Design a windmill from scratch)

1. Blade Design to achieve maximum electrical output

Concept:

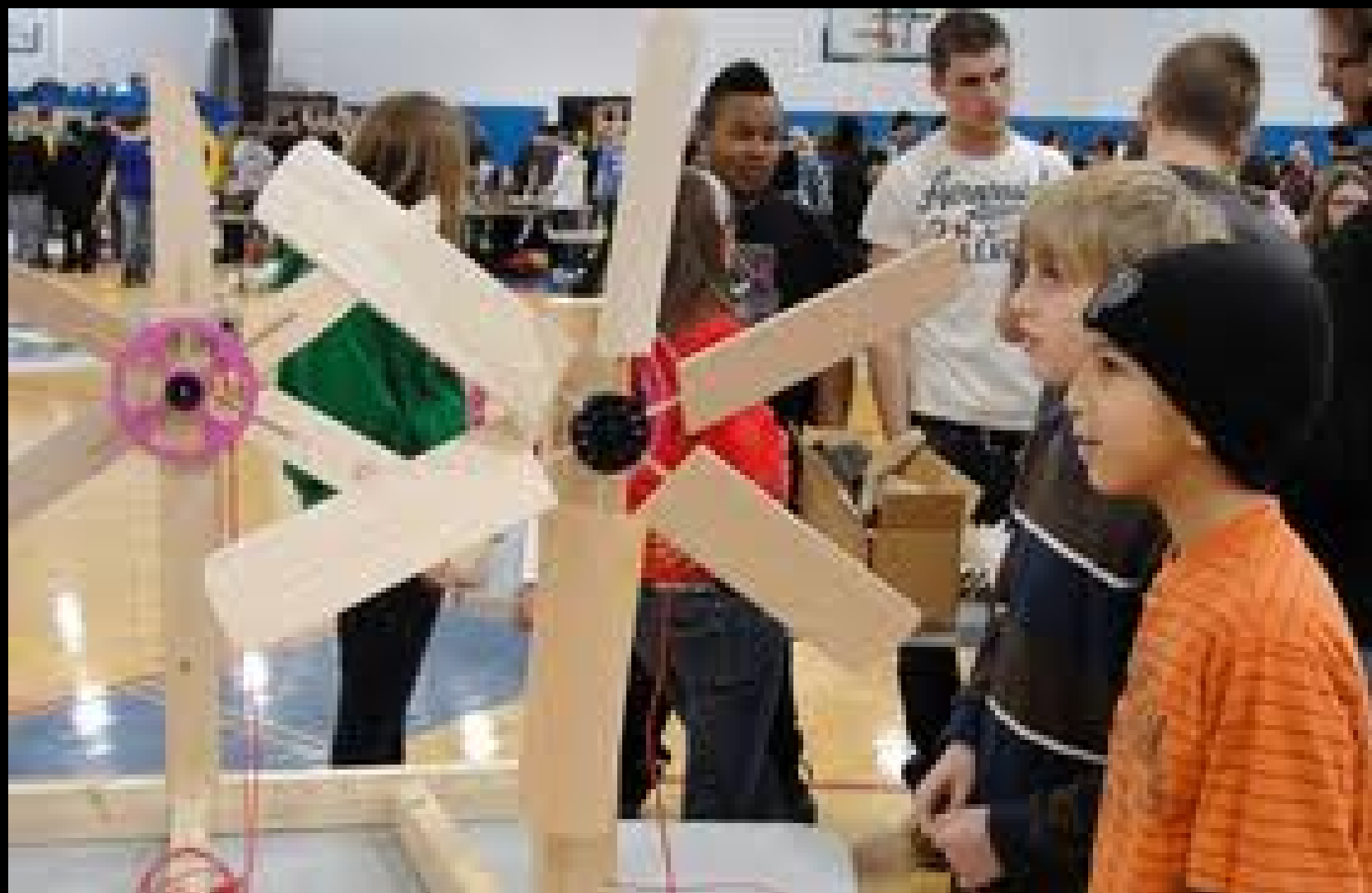
Students experiment to see which blade design produces maximum electrical output. Electrical output can be measured in volts (simplest), volts with a resistor (more difficult) or watt-seconds (most difficult)

Students experiment with:

- Number of blades
- Mass of blades
- Blade materials
- Distribution of mass
- Pitch
- Electrical output

Materials Needed

- KidWind tower
- Crimping hubs (1 per student is ideal)
- Dowels
- Blade material (students can be challenged to find their own materials)
- Window fan
- Multi meter
- 10 ohm resistor is optional
- Wind tunnel is optional
- Vernier software is optional



2. Blade design to achieve maximum lift

Concept:

Students design blades to see which designs achieve maximum lift. The blades that are successful in this competition are configured very differently than those that are successful in the first competition.

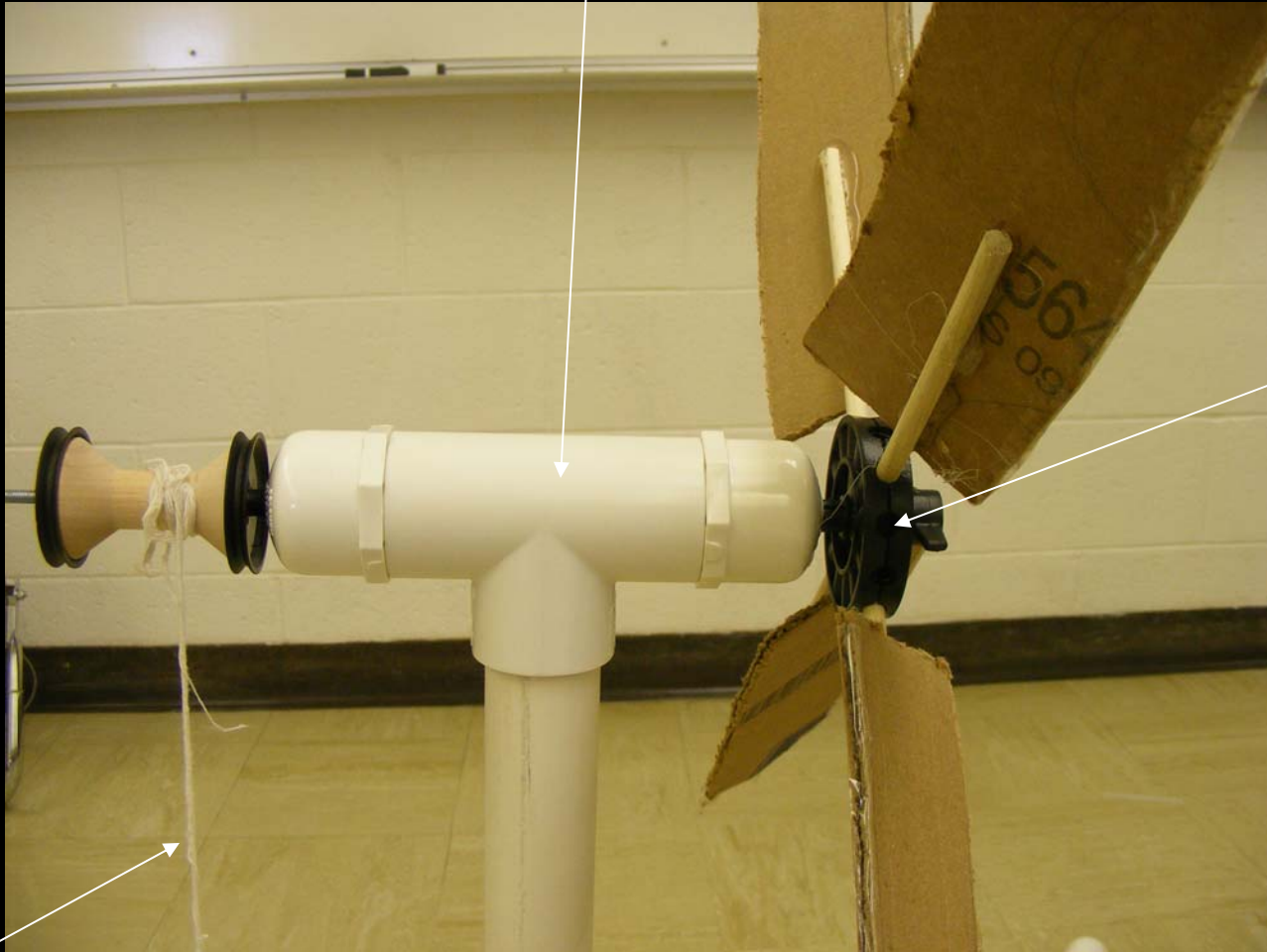
Students experiment with:

- Number of blades
- Mass of blades
- Blade materials
- Distribution of mass
- Pitch

Materials Needed

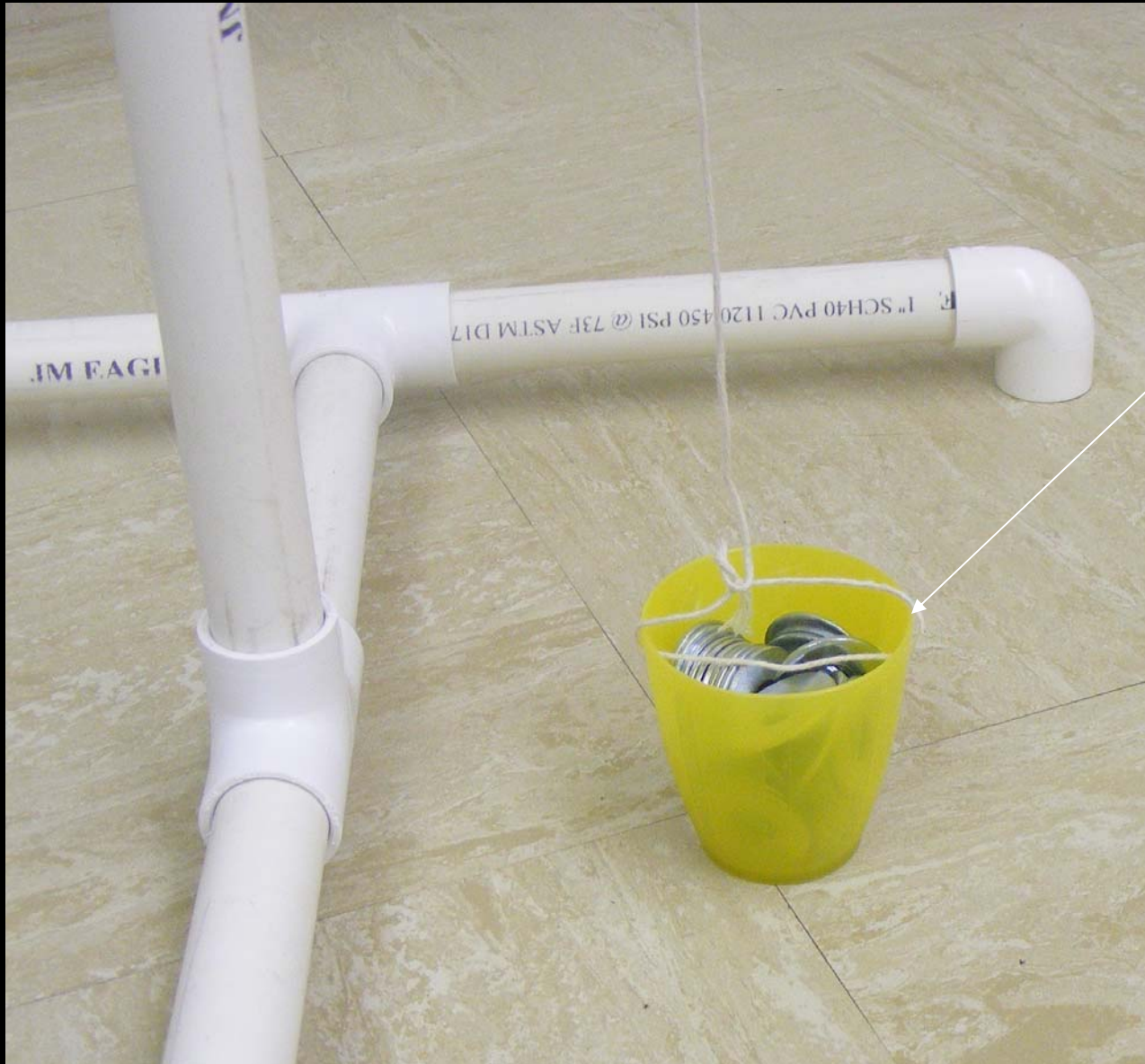
- KidWind tower
- KidWind lift head with weights
- Dowels
- Blade material (students can be challenged to find their own materials)
- Window fan

KidWind Lift Head



Hub
and
Blades

String attached to weights



Weights
attached to
Lift Head by
String

3. Blade and Gear Challenge

Concept:

Students design blades and then attach those blades to gears which are then attached to a generator. Students can use KidWind gears and hubs (easiest) or can design their own gears and hub (harder)

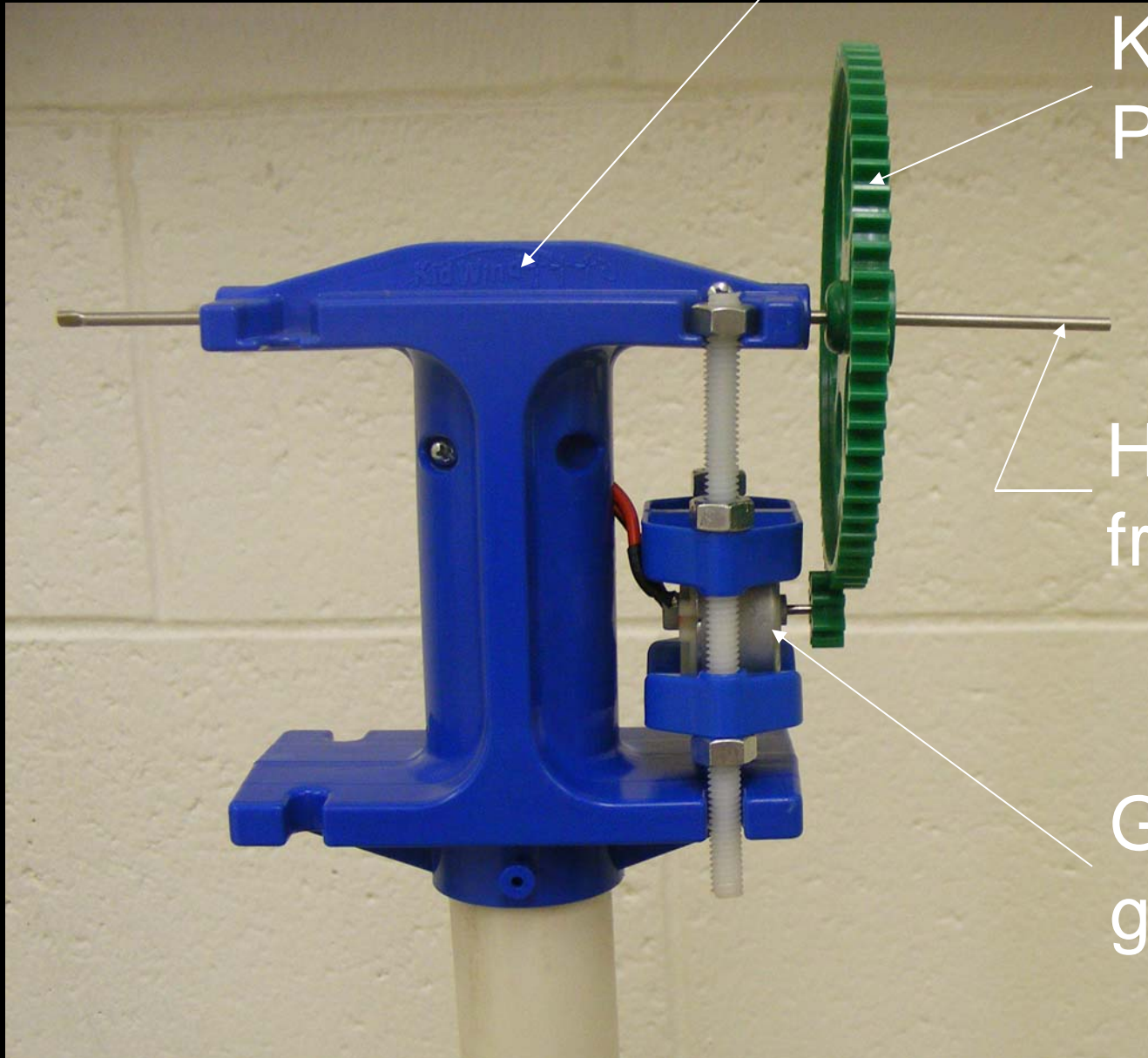
Students experiment with:

- Number of blades
- Mass of blades
- Blade materials
- Distribution of mass
- Pitch
- Gears

Materials Needed

- KidWind tower
- KidWind specialty hub
- KidWind Gear package
- Dowels
- Blade material (students can be challenged to find their own materials)
- Window fan
- Other gears (optional)
- Multi meter or Vernier software and probes

KidWind Specialty Hub



KidWind Gear Pack

Hub attaches in front or behind

Generator with gear

4. Blade, gear and generator challenge

Concept:

Students combine their knowledge of blades and gears with their experiences with generators to make the “guts” of a wind turbine to generate maximum electrical output. Students can use KidWind kits (easier) or they can put together their own gear and generator arrays (harder).

Students experiment with:

- Number of blades
- Mass of blades
- Blade materials
- Distribution of mass
- Pitch
- Gear arrangements
- Generator construction (number of windings, magnet arrangements, etc.)

Materials Needed

- KidWind tower
- Dowels
- Blade material
- Window fan or wind tunnel
- Multi meter or Vernier software
- KidWind gear kits or scrounged gears
- KidWind generator kit or homemade generator



KidWind
gear kit

KidWind
generator kit

KidWind specialty hub

5. Free For All

Concept:

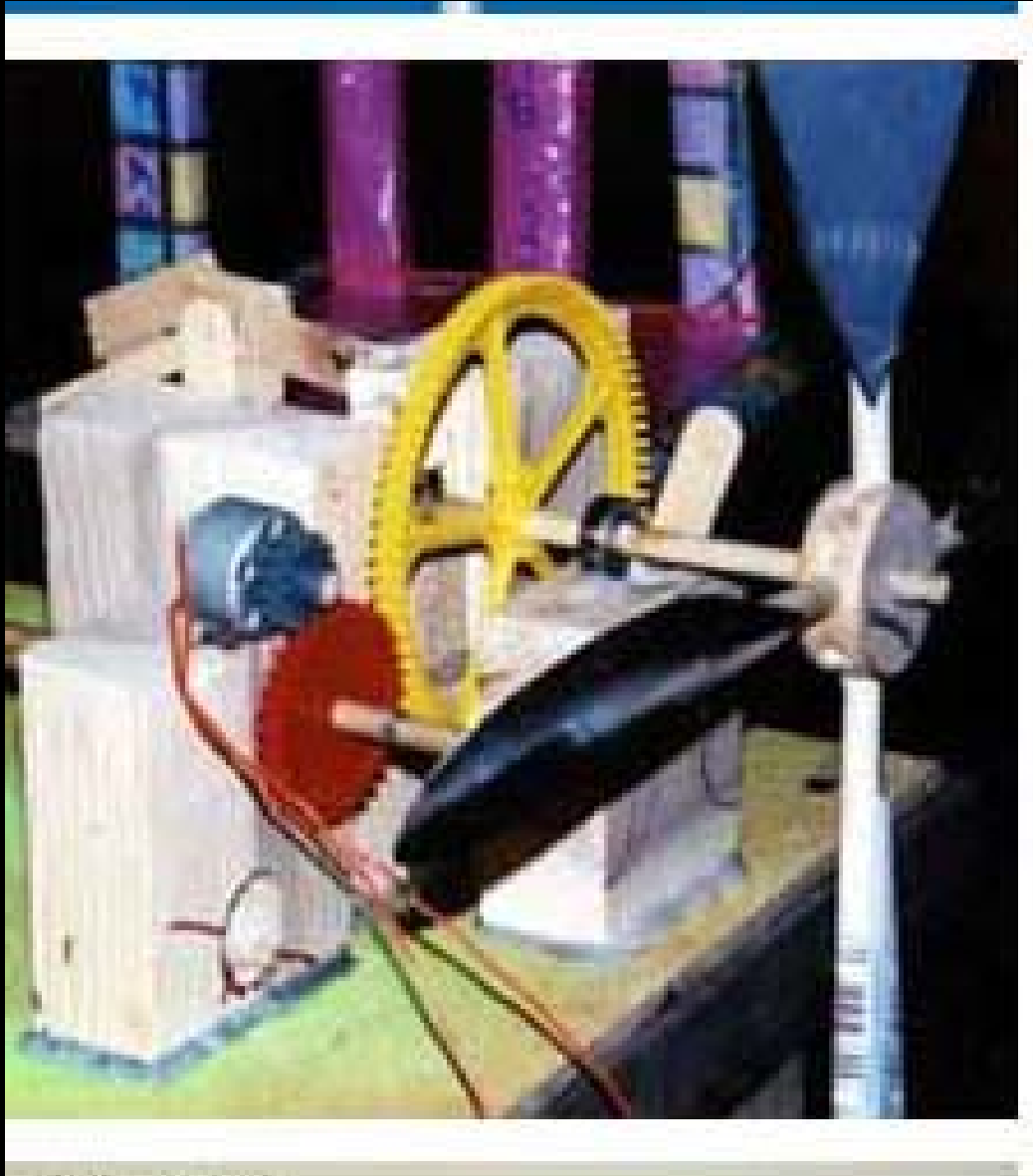
Students design and build a windmill from the ground up to obtain maximum electrical output. Stock gear boxes, generator kits, etc. are not allowed.

Students experiment with:

- Blades
- Gears
- Generators

Materials Needed

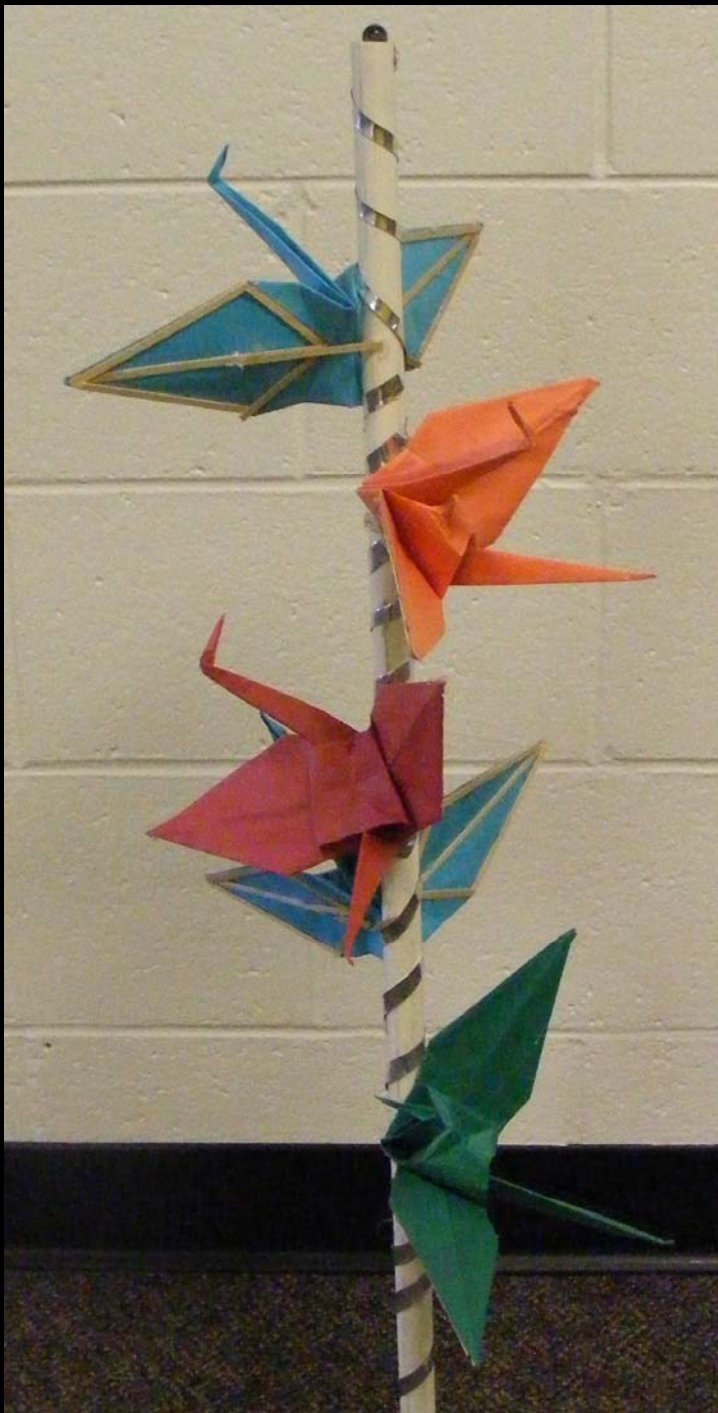
- Whatever
- Multi meters or Vernier Software



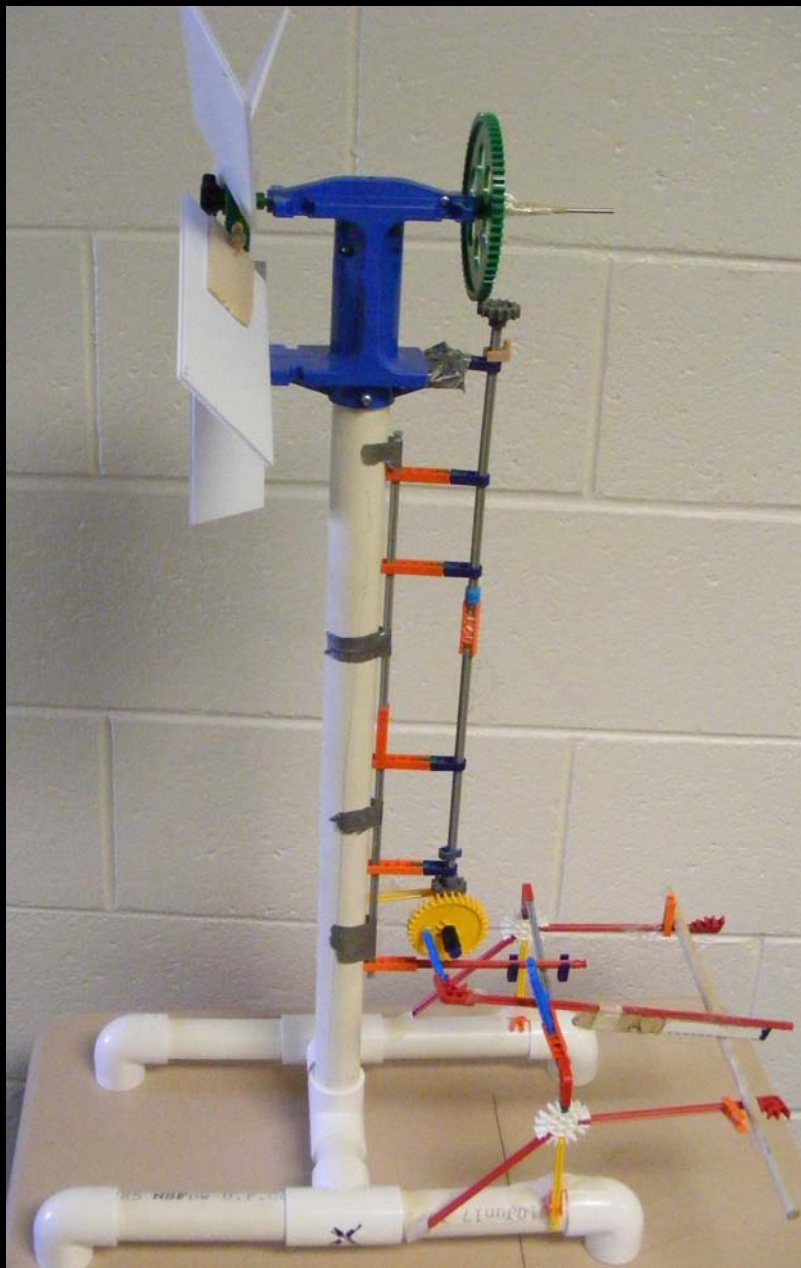
II. Non Competitive

Rationale: Many students get discouraged the minute competition is mentioned. Others start a competition with enthusiasm and then quit when their efforts don't bring immediate results. Many of these students thrive in a non-competitive atmosphere.

Concept: Students come up with their own challenge. The challenge can involve art (kinetic sculptures), sound, optics, engineering, recycling, etc. There are no awards



This student
wanted to make a
kinetic sculpture
using origami



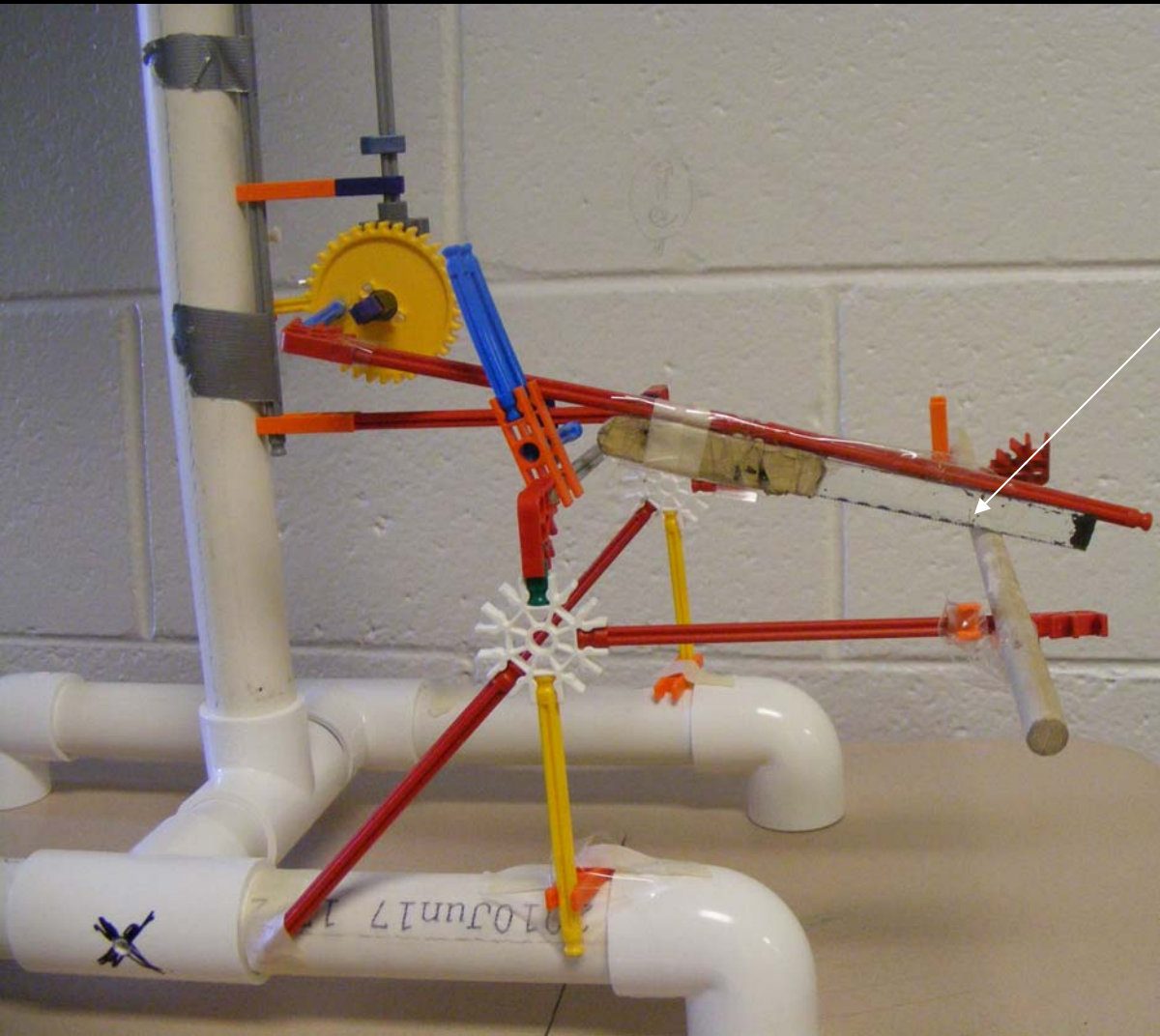
This student wanted to design a windmill that cut wood.

KidWind Specialty
Hub



KidWind Gears

K'Nex Pieces



Saw and
Wood

End of Part VII