Tinkering with Solar Panels

TINK@School

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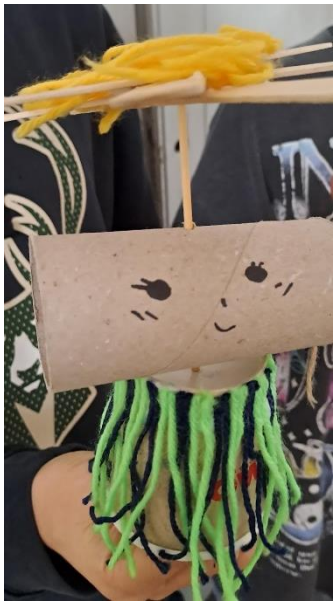
Tinkering with Solar Panels

Duration	*3 hours*
Target group	*Students that are able to safely handle hot glue and electrical wiring from solar panels (approximately ages 10 and up)*
Connection to curriculum	*This activity is well suited for exploring solar energy and for discussing sustainable energy sources. It can be connected to the art curriculum and to the physics and sciences curriculum.*
Particulars	*This activity has been developed as a second step of the Scarecrow artwork activity. We suggest you allow an extra 60 minutes for the first section if you have not started with the Scarecrow. Needing solar power, the activity works better if you can set the working area outside and it benefits from good weather - which allows solar panels to properly function.*



Outline

Do we know what we talk about when we mention renewable energy and solar power in particular? Starting from a group discussion, participants are invited to design a moving scarecrow, brought into motion by solar power. Creativity is engaged in designing the scarecrow, which is built out of recycled materials, previously collected by the students themselves. Engineering mechanisms need to be discovered in order to make the scarecrow move on solar power. The final product is a scarecrow army, well suitable for protecting school lawns and flowerbeds from birds.

Connection with sustainability

The whole project revolves around sustainability issues, starting from the search for used materials for producing the scarecrow and ending with using solar power as the propelling energy. Seeing solar power at work enables students to gather a better understanding on the application of renewable energy.

Health and safety

Hazard	Controls
Tins might have sharp edges and students can cut themselves.	*Have a first aid kit in the classroom and express caution for handling sharp materials.*
Hot glue guns can be hot and students can burn themselves	*Give an instruction on how to use the glue guns. Let the students use them in a designated place, and keep an eye on it.*

Essential materials

Item	Comment	Total
Tape		5 rolls
Wooden sticks		2 boxes
Toothpicks		4 boxes
Wool		3 skeins
Rubber bands		3 boxes
Tins or plastic boxes		1 per pair
Picture frames		10
Recycled materials		Enough to tinker with

Essential tools *[fill in the table, if needed add a photo]*

Item	Comment	Total
Solar cells		1 per pair
Engines		1 per pair
crocodile clips		4 per pair
Hand drill	place these on a designated table	1 set per 4 pairs
Hot glue	place these on a designated table	3
Glue		1 bottle per 2 pairs

The list of materials and tools is not exhaustive, but it is important to have a variety of materials available. Adapt this list to the prompt you give the students.

Preparation

Prepare the classroom in advance, arranging the different materials on tables, sorted according to type of material, size, and color. Place the materials and tools on different tables around the classroom. Work stations are transformed into lively, creative islands. Prepare two ad hoc tables, one for using hot glue and the other for using the hand drill. These working areas can be used taking turns, while the construction activity takes place on desks.

Activity Plan

Introduction (45 minutes)

- Participants are encouraged to share their thoughts on renewable energy and its effects on the planet.
- To introduce the activity, the teacher engages the class in a discussion on renewable energy sources and explores their range.
- The challenge of the activity is shared with the class: each pair needs to employ solar energy to make a specific item move. A brief research is undertaken to gather inspirations for the construction (this part can be skipped if the class has already undertaken the *Scarecrows Artwork* activity)
- The class is invited to explore the range of materials collected, the setting of the room, the special tables. The time for the activity will be stated, so that everybody can manage their own time frame.
- Child-friendly models and examples are shown to spark inspiration and show that the possibilities are as limitless as their imagination.
- The prompt: design an object that can move with solar power. The educator can modify the prompt by mentioning the size, weight, or balance to steer the activity in that direction (e.g. the object needs to be lightweight)
- The teacher outlines simple and clear rules, emphasizing safety and teamwork.

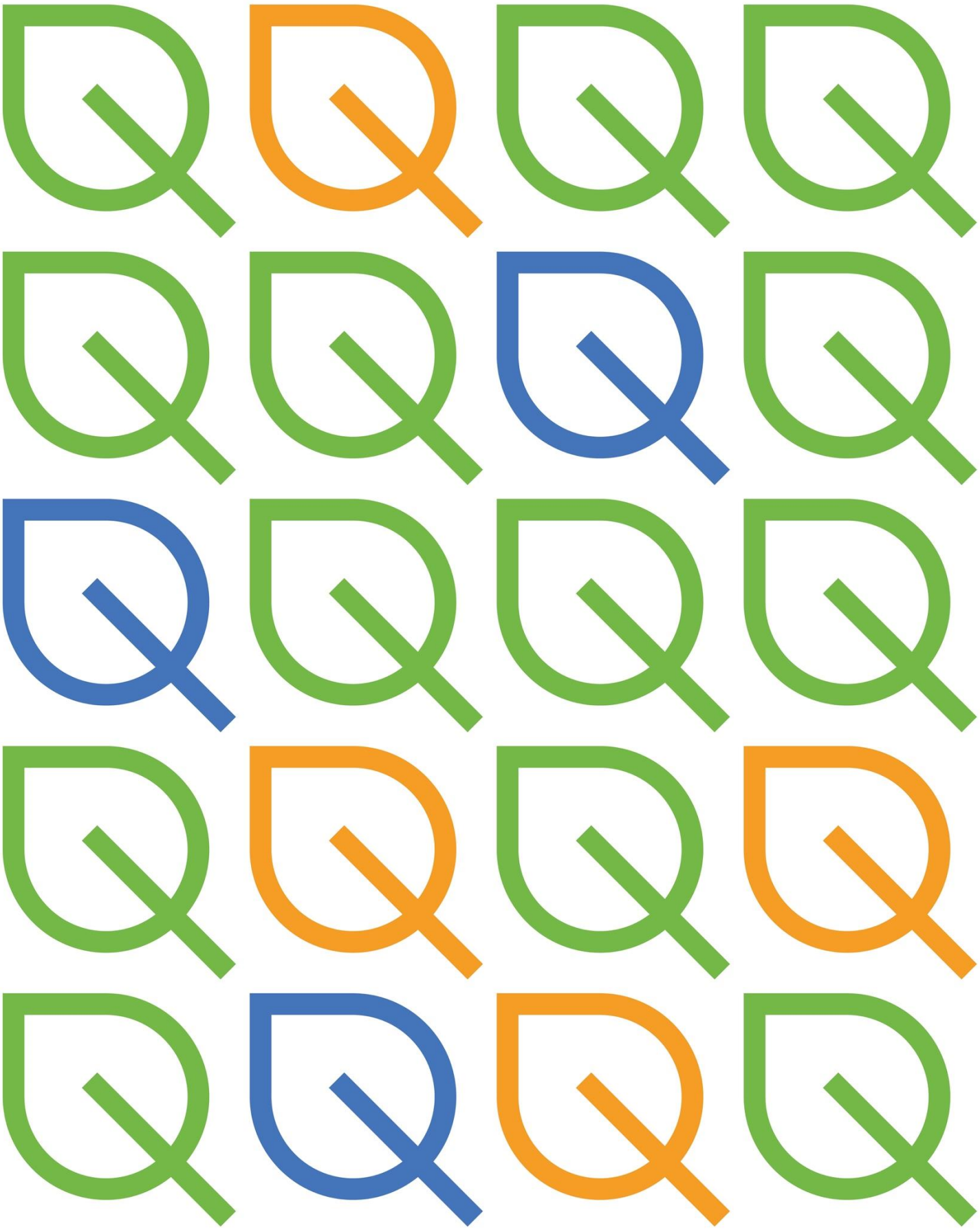
Managing the activity once it is in progress (120 minutes)

- The students choose their work partners and work in pairs.
- Teachers support the students' ideas and give alternatives when needed, suggesting to observe other pairs and encouraging those who feel stuck by providing different materials or options.
- Pay attention to safety, students work with glue guns which get hot.
- Ask questions to get students thinking about possible solutions or to help them articulate their goals or problems. Then ask questions that make them see for themselves where things might be going wrong or encourage them to come up with solutions.
- Write down events or statements from students that stand out, to use when discussing the activity afterwards. (E.g: If you saw them working together really well, or overcoming a frustration.)
- Have the groups round off after 110 minutes.
- In case the students finish earlier, the activity can also be stopped earlier. Let it depend on the group.
- Clean up, make sure that materials that can be used again are not thrown away and paper scraps are collected in the paper trash.
- Tips for guiding this activity:
    - Encourage students to make the moving part first before attaching the solar cell and engine.
    - Encourage students to find out in what ways the engine can move and how they can influence it

Conclusion

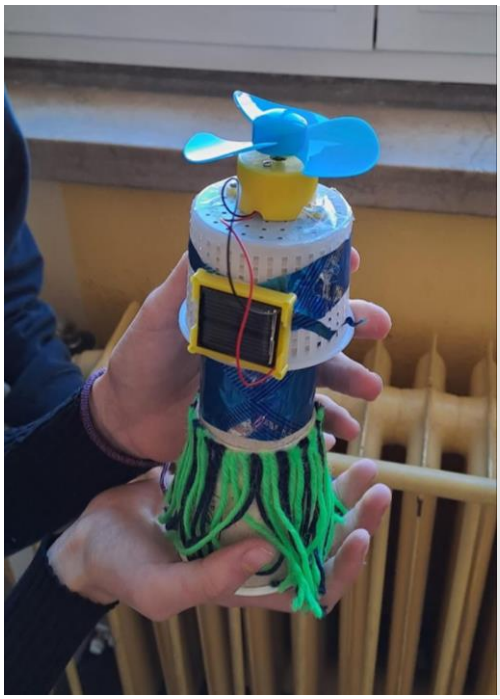
- At the end of the activity, each pair presents their work to the others. The teacher can stimulate the presentation by asking what difficulties were encountered, how they overcame the difficulties and what progress was made during the work. The teacher can ask how they collaborated, where they drew inspiration from for their design, whether they deviated from their initial ideas and how.
- Have a concluding discussion regarding solar power: have they gathered new thoughts on the matter? What are their observations? What have they learned? Have they concocted new ideas about sustainability? Do they feel empowered by having designed a machine working with solar power?

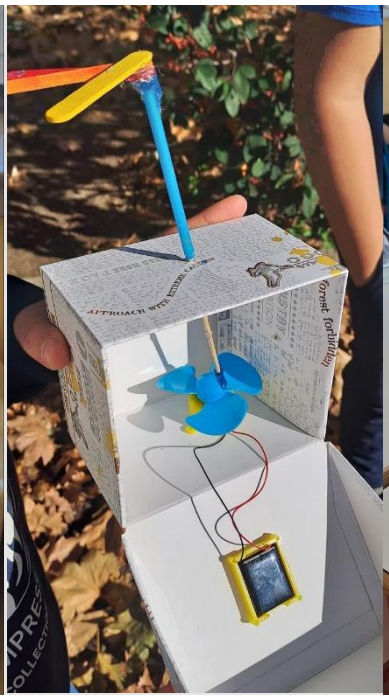
This activity can also be done as a stand-alone activity. Make sure to collect more recycled materials for the students to tinker their object with.



Appendix

Appendix Examples of possible outcomes





Colophon

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