

# Training Guide

for *The Power  
of the Wind*

3-Hour  
Introduction



# Acknowledgements



## Training Guide for *The Power of the Wind*

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**The Power of the Wind Training Guide would not have been possible without The Power of the Wind Youth and Facilitator Guides.**

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# Welcome



### Purpose:

- To identify the purpose of the training.
- To identify key components of the 3-hour training.

### Time:

15 minutes

### Materials:

#### Trainer

#### Resource:

- Agenda on Flipchart

#### Handout:

- *The Power of the Wind*  
3-hour  
Training  
Agenda

### Trainer Notes:

## STEP 1: Welcome and Overview of Curriculum

Welcome to *The Power of the Wind* training. Some of you may have more experience than others in facilitating groups of youth in their learning. The overarching goal of this workshop is to enhance your ability to successfully work with youth using *The Power of the Wind* Youth and Facilitator Guides. This training is dependent on *The Power of the Wind* Youth and Facilitator Guides and is designed to deepen your knowledge and skills on how to use those guides most effectively.

*Choose about 4-5 questions from the Curriculum Scavenger Hunt Trainer Resource that provide the best overview. Ask participants the 4-5 questions you have selected. Give participants time to find the information and share verbally. Add on additional information as needed.*

## STEP 2: Review Agenda

*Go over the 3-hour training agenda with the participants. Comment briefly on what will happen at each agenda item. Explain that participants will be becoming familiar with the curriculum; experience two activities and there will be time for questions and answers at the end.*

- I. Overview – Opening – Quick walk through the Guide – 15 minutes
- II. How Does a Pinwheel Use Wind Power? – 45 minutes
- III. Examining the Engineering Design Process – 20 minutes
- IV. Break – 15 minutes
- V. Designing a “Better” Pinwheel – 60 minutes
- VI. Question and Answers – 15 minutes: *How are you going to use it; what challenges do you see you might have; where are the resources and support?*
- VII. Closing – 10 minutes





## How Does a Pinwheel Use Power?

### Purpose:

- To become familiar with a new activity from the curriculum.
- To become competent in completing an engineering-based lesson.
- To identify ways content can be embedded in lessons.

### Time:

45 minutes

### Materials:

Internet connection, computer, LCD projector, scissors, straight pins, pencils with erasers, pinwheel pattern from Appendix A or B, pages 14–15 of the Youth Guide

### Trainer Notes:

#### STEP 1: Context

*Explain to participants that they will complete investigations using the engineering design process, learn about the process itself, and redesign a “product.” This is the first of three workshop segments that will scaffold and help them become competent in leading this curriculum based on engineering design principles.*

#### STEP 2: Activity

Let’s get going! You will have an opportunity to create a pinwheel, a form of a turbine. You will have 30 minutes to complete the activity “How Does a Pinwheel Use Wind Power?” on pages 14–15 in the Youth Guide. Please work with someone who you have not yet worked with. Materials are located \_\_\_\_\_ *(tell participants where materials are located)*.

*As participants are doing the activity, the facilitator should move around the room and check in with groups to identify progress and challenges they are having. The activity can take about 30 minutes but if the majority of participants are done early or need extra time, the length of time spent on the activity can be adjusted. Notify participants when they have 5 minutes left. This cue will help them wrap up the activity.*





## STEP 3: Discussion

*Have participants walk around and see what each group did. Have each group share a little about their process. As groups are sharing, choose some of the following questions.*

- When the wind blows straight into the front of the pinwheel, it turns. What happens when the wind blows into the back of the pinwheel or if it blows into the sides? Try both sides and see what happens.
- What adjustments can you make in the design to make your pinwheel turn better?
- How does the pinwheel use the power of the wind?
- The pinwheel and your boat both use wind power. How are they similar? How are they different?<sup>2</sup>

## STEP 4: Transition

*Explain that through this process participants just completed a portion of the engineering design process. Tell participants that they will now spend some time working through the engineering design process and reflect on the pieces they've completed. When done explaining, they will have an opportunity to complete the process by redesigning their pinwheel.*



<sup>2</sup> Sebestick, J. *The Power of the Wind Youth Guide*. University of Illinois, 2008, p. 15.





# Examining the Engineering Design Process

## Purpose:

- To identify the components of the engineering design process
- To identify how the engineering design process works and how it is implemented with *The Power of the Wind*

**Time:** 20 minutes

## Materials:

### Trainer Resource:

- Engineering design process
- Flip chart with engineering design process

### Handout:

- Engineering design process chart
- Page 8 of the Youth Guide

## Trainer Notes:

### STEP 1: Context

*The Power of the Wind* includes the engineering design process and it is important for you to know about this process as you are working with youth. As you built an initial pinwheel, tested, and are now thinking about redesign, you are going through the engineering design process. Please turn to page eight in the Youth Guide. Let's apply the engineering design process to the activity you did.

### STEP 2: Discussion of Process

*With the chart on the wall and participants referring to it in their books, walk through it briefly so they think about each component. As you do, ask participants about each step and whether they used this in their pinwheel design. Use the trainer resource sheet to discuss the components. If time allows, ask the following questions:*

- What do you notice on this chart?
- How many of you have used something like this with youth already?
- How might this help young people think through their design and their role as engineers?





## STEP 3: Discuss Applying with Youth

The engineering design process really is about identifying a challenge or problem, identifying solutions, testing them, getting results, and making the product better. Think about new products coming out all of the time. One product may have several models or versions. Engineers are continually improving their products.

- How would you go about making this a focal point of the lessons?
- How do you think youth will benefit from using this model?

## STEP 4: Transition

In the next activity, we will use the engineering design process again, but, this time, instead of thinking about it after you have done the activity, I want you to complete the chart as you are doing each step. This is a way for you to become more familiar with the process and to make decisions as a group. Working as “teams” is another important part of how engineers design and an exciting part of this career.

*Hand out the engineering design process chart and say that in the next activity they will have a chance to complete this chart for how they make the pinwheel “better”.*



## **STEP 1: What is the challenge?**

Engineering work is based on “challenges” or “problems.” There must be a problem for engineers to solve. Clearly identifying the problem or challenge is the first step to thinking like an engineer.

## **STEP 2: How have others solved this?**

Engineers don’t think only by themselves. In order to be efficient in their work, before they attempt to find a solution, they gather information. They might look at similar problems, geography, or a magnitude of projects. They may ask other engineers or researchers, or tap into their prior experiences.

## **STEP 3: What are the design criteria and constraints? Brainstorm possible solutions.**

Before engineers can identify possible solutions, they need to know what is available to them. What is their budget? What are the materials? How much time is available? After identifying these, they can begin to brainstorm possible solutions.

## **STEP 4: Which of the possible solutions do you choose?**

Engineers don’t identify only one possible solution. They brainstorm several solutions and identify the pros and cons of each. During their identification of pros and cons, they take into consideration what they know from steps two and three. After careful thought, they can select the best solution for the problem.

## **STEP 5: Build a prototype.**

A prototype is a first design of the solution. Engineers know that their work will be refined and the product made better, but they always need to start with an initial design.

**STEP 6: How does it work? Try it and test again.**

After the prototype is built, it must be tried and tested. Engineers will do several tests to ensure reliability. During the testing phase they will note what works well and what parts of the product need to be improved. They observe and record carefully.

**STEP 7: How do you learn from the designs of others?**

It is likely that others are working on similar problems or challenges. By sharing those problems and challenges with other engineers, they can get additional ideas for their design and products.

**STEP 8: How can you use your new ideas to improve your design?**

Looking closely at the initial prototype, data records from initial trials, and learning from others, engineers will redesign and refine to make their products better.





# HANDOUT Engineering Design Process Chart

Remember that the engineering design process is always a circular process like the chart in the Facilitator Guide. This handout merely gives you a place to record your thoughts and progress.

Engineering Design Process	Pinwheel
What was the challenge?	
How have others solved this same challenge?	
What were the design criteria and constraints? How did you brainstorm possible solutions?	
What possible solutions did you choose?	
How did you go about building your prototype?	
How did it work? How did you test it and try it again?	
What did you learn from the design of others?	
How can you use your new ideas to improve your design? <sup>3</sup>	

<sup>3</sup> Sebestick, J. *The Power of the Wind Youth Guide*. University of Illinois, 2008, p. 8.





## Designing a “Better” Pinwheel

### Purpose:

- To become competent in completing an engineering-based lesson.
- To become skilled at leading engineering based lessons.
- To increase ability to lead an activity from *The Power of the Wind*.

**Time:** 60 minutes

### Materials:

- Scissors
- Straight pins, pencils with erasers, paper (various weights), pinwheel patterns, paper plates, aluminum pie plates, paper clips, coffee stirrers, popsicle sticks, pages 16–17 in both the Youth and Facilitator Guides

### Trainer Notes:

#### STEP 1: Context and Introduction

Now that you have constructed an initial pinwheel and talked about the engineering design process, I have one more challenge for you. In the business world, scientists and engineers are always trying to find ways to improve products and refine their work. Now you will have a chance to make your pinwheel even “better” than we did the first time. Your challenge is to design and construct a “better” pinwheel than your current one.

*Someone may ask what “better” means. In this case, groups can decide HOW they want to make their pinwheel better. Possible ideas include: turn faster, turn for a longer period of time, bigger, smaller, etc. You may want to ask: What are ways you can think of to define better? What would make it better for your team?*

Using the handout for the engineering design process, I want your groups to document what it is they are doing. Take each step and think as a group about how you want to proceed and what it is you want to be able to accomplish. Not unlike other things we have done, this is the intentional aspect of the engineering design process—what do you want to accomplish and how will you figure that out?





## STEP 2: Activity

You will have 30 minutes to design and construct a “better” pinwheel. Materials are located \_\_\_\_\_ *(tell participants where materials are located)*.

*As participants are doing the activity, the facilitator should move around the room and check in with groups to identify progress and challenges they are having. This may be a time when the facilitator encourages the learning with open-ended questions about what is happening, what they have done, what they want to do. Remind people about the handout of the engineering design process. Ask them to make notes on each step of the process as they make a “better” pinwheel. The activity can take about 30 minutes.*

## STEP 3: Discussion

Now that you have each completed the activity, let’s share with the group. Remember, we are doing this as though we were “learners” so share as though you were a youth going through this activity. Each small group needs to describe their design and redesign to the large group.

*Ask the following questions of each group after they share about their model:*

- What element of the design did you choose to make “better”?
- How did you go about doing it (what was the process)?
- What did you learn through doing this?

## STEP 4: Review as Facilitators

It is now time to once again take off your “learner hats” and put on your “facilitator” or “group leader hats.” Let’s spend some time thinking about what you did and consider what it means to you as a leader working with youth.

Please turn to pages 16 – 17 in *The Power of the Wind Youth Guide*. The activity “How Can We Design a Better Pinwheel?” is essentially the same activity you completed. Let’s look closely at the lesson and see what additional ideas are included that might help you as a leader or a youth complete this activity.





*Have participants look at the lesson in both Youth and Facilitator Guides.  
Have them share additional items that they had not thought about in their activity.*

## STEP 5: Review the Process

We had you document what you were doing at each step of the engineering design process so you could become familiar with the steps and think about what this meant to implementing *The Power of the Wind*.

- Why do you think we had you use that tool?
- In what ways did it help you become familiar with the steps in the process?
- What was it like to document what you were doing?
- How might this work with the youth you work with?
- How might you want to do this differently?

## STEP 6: Transition

Let's take a minute now to answer some of your questions and think about when to get resources.





## Resources and Questions

### Purpose:

- To identify additional resources to support the implementation of *The Power of the Wind*.
- To identify strategies for answering questions or challenges.
- To determine how *The Power of the Wind* will be implemented.

**Time:** 15 minutes

### Materials:

#### Trainer Resource:

- Resources for Facilitators Guide Sheet

#### Handout:

- Resources for Facilitators

### Trainer Notes:

#### STEP 1: Resources for Facilitators

*Distribute the Resources for Facilitators handout to participants. Explain that this is a starting point for where they might look for additional resources. Ask participants to take a couple of minutes to look over.*

The handout you received does not cover all of the possible resources that can help you as a facilitator. Rather, if you have questions as you work through *The Power of the Wind* Curriculum, or as you read through the Facilitator's Guide, you may want take the participants online to review the links to provide additional information.

The first link is the main website and has many other links embedded. The rest of the links on the sheet come from the main page, but not all are listed. I purposely selected the rest of the links listed because they can be meaningful in directly supporting what you have done in this training.

*See Training Resource – Resources for Facilitator's Guide Sheet. It gives additional information of various links that can be explained to participants.*





## STEP 2: Questions & Answers

Before we leave, we want to make sure that if you have additional questions that we take some time to answer those. I want to pause now and make sure that there are no burning questions or comments that we still need to cover together.

- As you are thinking about implementing *The Power of the Wind* what are some questions you still have?
- What do you see might be a challenge or obstacle you might have to overcome?
- What suggestions might we have as a group for helping with those challenges or obstacles?

Remember that some of the best learning you can do is with each other. As you complete activities, or have questions, don't be afraid to contact each other or refer to the other resources that were brainstormed in this training.

All of us are still learning how to implement this curriculum. It will happen quite differently in different places, and we can learn about those differences and similarities.





# TRAINER RESOURCE Resources for Facilitators Guide Sheets

**Visit the web site ([www.4-H.org/curriculum/wind](http://www.4-H.org/curriculum/wind)) and follow the links.**

## ***The Power of the Wind Website***

*The main website that has links to Table of Contents, Facilitator Guide, Engineering Notebook, the philosophy of 4-H and much more!*

This is the main website that contains all of the links below. In addition to the links below, other resources that can be found here include: overview of the curriculum, promotional posters, National Directory of 4-H materials, National 4-H Curriculum, and completion certificate. This website is specific to *The Power of the Wind* Curriculum, so the support materials are very specific to the Guide.

## ***The Power of the Wind Facilitator Guide Website***

*Provides helpful hints for facilitators. Scroll down and you will find links to content about wind energy.*

This link includes many basics for 4-H facilitators such as the experiential learning process, the engineering design process, the essential elements, and facilitator tip sheet. In addition, you can find the templates that make it easy to print off copies for participants. It discusses in brief each lesson that gives you a better understanding of how the lessons are organized and arranged.

## ***The Power of the Wind Table of Contents***

*Provides an overview of the lessons as they are sequenced in the book.*

This link provides an overview of the table of contents with the order of the lessons. If you only have a few sessions with youth, or have certain learning outcomes you want to work on, it can help you in identifying which lessons might be most appropriate. Each lesson is broken down into investigation, challenge, and exploration. (See the resource sheet guide for the scavenger hunt for more information about these three types of lessons.)





# TRAINER RESOURCE Resources for Facilitators Guide Sheets

## **The Power of the Wind Engineering Notebook**

Visit the web site ([www.4-H.org/curriculum/wind](http://www.4-H.org/curriculum/wind)) and navigate to the youth portion. There you'll find downloadable sheets that can be used as additional engineering notebook pages.

*Provides additional sheets youth can use as they collect, record, and communicate data. Copies can be made of these extra notebook pages just like they are seen in the book!*

There are sheets in the back of the Youth Guide that can serve as an engineering notebook or place for youth to record data. If more sheets are needed, they can be quickly printed off with the gridlines and provide more space for youth to write.

## **Grab and Go Activities**

Visit the web site ([www.4-H.org/curriculum/wind](http://www.4-H.org/curriculum/wind)) and navigate to the Grab and Go subpage.

*If you are looking for extra activities to use, check out this link. These activities provide step-by-step directions for youth to create a device that measures wind speed, make a kite, measure air pressure, and hold a wind power debate in their community. Minimal prep needed!*

The grab and go activities are stand alone and can be used in a youth setting that only meets once. More specifically, youth won't need to complete activities prior to this one, in order to do this successfully. If participants need a reinforcement activity, these may be appropriate. Materials needed to complete the activity are also listed here.

## **Interactive Media**

Visit the web site ([www.4-H.org/curriculum/wind](http://www.4-H.org/curriculum/wind)) and navigate to the Interactive Media subpage.

*Are you looking for lesson extensions, more activities, and fun games for youth to do? Check out this website for additional youth support materials for most lessons!*

This site has several links within it. If youth get excited about a certain lesson and are looking for places to do further research, take online quizzes, or play online games, each lesson has links that can help them further explore their learning in that area.

*Note: There are many other resources that aren't included in this site. These are just a few that can help you have successful experiences leading youth.*



**Visit the web site ([www.4-H.org/curriculum/wind](http://www.4-H.org/curriculum/wind)) and follow the links.**

### ***The Power of the Wind Website***

The main website that has links to Table of Contents, Facilitator Guide, Engineering Notebook, the philosophy of 4-H and much more!

### ***The Power of the Wind Facilitator Guide Website***

Provides helpful hints for facilitators. Scroll down and you will find links to content about wind energy.

### ***The Power of the Wind Table of Contents***

Provides an overview of the lessons as they are sequenced in the book.

### ***The Power of the Wind Engineering Notebook***

Provides additional sheets youth can use as they collect, record, and communicate data. Copies can be made of these extra notebook pages just like they are seen in the book!

### ***Grab and Go Activities***

If you are looking for an extra activity to use, check out this link. These activities provide step-by-step directions for youth to create a device that measures wind speed, make a kite, measure air pressure, and hold a wind power debate in their community. Minimal prep needed!

### ***Interactive Media***

Are you looking for lesson extensions, more activities, and fun games for youth to do? Check out this website for additional youth support materials for every lesson!

# Closure and Evaluation



### Purpose:

- To bring a sense of closure to the training.
- To provide feedback on the training for improvement.

### Time:

10 minutes

### Materials:

#### Handout:

- Evaluation form

### Trainer Notes:

#### STEP 1: Closing

*As a closure activity, think of something that will be significant to the group and brings some closure. One possibility is to have each person describe the training as either a pinwheel or a sailboat and why they chose that one. This gives them a chance to express something and let's everyone know a little more about their impression of this training. This is one of those activities that is a remark without comment and tends to go very quickly.*

#### STEP 2: Evaluation

*Ask each person to complete the evaluations and note it is only through this feedback that we can continue to learn what works and what doesn't and how to make this the best learning experience possible. Collect the evaluations as people get done. Thank them as they leave.*





# HANDOUT *The Power of the Wind* Training Evaluation

## Help us improve future trainings!

1. Overall, how would you rate the training you received for *The Power of the Wind*?  
 Excellent  
 Good  
 Fair  
 Poor
2. What factors made you rate the training the way you did?
3. What do you feel was the most beneficial part of the training?
4. What, if anything, would you change about the training? If you wouldn't change anything, please write "nothing."
5. What could 4-H staff do to support you in leading *The Power of the Wind* activities?





# HANDOUT *The Power of the Wind* Training Evaluation

6. What would you still like to know about using *The Power of the Wind* with others? What questions do you still have?

7. Now that you've participated in the training, how would you rate your level of disagreement or agreement with the following statements?

	Strongly Disagree	Disagree	Somewhat Agree	Somewhat Agree	Agree	Strongly Agree
a. I feel prepared to lead <i>The Power of the Wind</i> activities.						
b. I am confident I could facilitate youth learning about <i>The Power of the Wind</i> .						

**The following questions are to help us better understand the diverse experiences of 4-H leaders and volunteers. All questions are optional.**

8. Including this year, how many years have you been a 4-H staff or volunteer? \_\_\_\_\_

9. Including this year, how many years have you been a staff member or volunteered with other 4-H science, engineering, or technology activities? \_\_\_\_\_

10. Do you have a professional background or experiences related to science, engineering, or technology? If yes, please explain.





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# 4-H Pledge

I Pledge my **Head**  
to clearer thinking,

my **Heart** to greater loyalty,

my **Hands** to larger  
service,

and my **Health** to  
better living,

for my club, my community, my country, and my world.

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