**Subject area/course**: Science

**Grade level/band**: 5th grade

**Task source**: New Hampshire Task Bank; Authors: Mary Wilke, Lindsey Foley, Liz Finney, Wendy Harrison, Jamie Zipke, Karen McCormack, Susan Lauze, Donna Palley, Chris Demers

**Whirligigs**

**TEACHER'S GUIDE**

1. **Task overview**:

Student will design and carry out a scientific experiment to test possible improvements to a prototype (in this case, a prototype whirligig). A fictionalized, real-world scenario will frame the work to be completed by students. This is an **in-class** activity that would take place over three days. The first two days, students work in teams to design an experiment to test their whirligig; after the experiment, students are required to demonstrate independently what they have learned about experiment design based on the instruction and hands-on experiences they’ve had in class.

1. **Aligned standards:**
2. **Primary Common Core State Standards**

**[CCSS.ELA-LITERACY.W.5.1.B](http://www.corestandards.org/ELA-Literacy/W/5/1/b/).** Provide logically ordered reasons that are supported by facts and details.

[**CCSS.ELA-LITERACY.W.5.2.E**](http://www.corestandards.org/ELA-Literacy/W/5/2/e/). Provide a concluding statement or section related to the information or explanation presented.

1. **Secondary Common Core State Standards (optional)**

**[CCSS.ELA-LITERACY.W.5.2.D](http://www.corestandards.org/ELA-Literacy/W/5/2/d/).** Use precise language and domain-specific vocabulary to inform about or explain the topic.

1. **Next Generation Science Standards (NGSS)**

**NGSS: 3-5-ETS1-3.** Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

1. **Critical abilities**

*Experimentation and Evaluation:* Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. Evaluate hypotheses, data, analysis, and conclusions, verifying the data when possible and corroborating or challenging conclusions with other sources of information.

1. **Other standards**

*New Hampshire Competencies*

**Structure and Function:** Students will demonstrate the ability to use evidence to support claims about the relationship among structure and function of natural and human designed objects.

**Cause and Effect:** Students will demonstrate the ability to investigate, explain, and evaluate potential causal relationships by using evidence to support claims and predictions about the mechanisms that drive those relationships.

1. **Time/schedule requirements:**

This task is designed to take place over the course of three days.

1. **Materials/resources:**
* Whirligig template
* Lab report template/graphic organizer
* Checklist
* Paper clips
* Scissors
1. **Prior knowledge:**

*Prerequisites:*

* Student will have had practice doing an in-class research activity
* Students will have had practice writing a lab report
* Students will have reviewed pertinent scientific terminology
1. **Connection to curriculum:**
* Assignment could be a second semester activity to measure student understanding of the research methods of scientists
1. **Teacher instructions:**

*Day 1 (getting familiar with the whirligig)*: Before the day of the actual assessment, students should have a chance to build a whirligig and play around with it, to become familiar with how it works and begin asking questions about its “flight”. The class could have a discussion about variables they’d like to change to see how the change affects the flight of the whirligig.

*Day 2 (design phase)*: Students are given the prompt and lab report template, and asked to design their experiment to test their own whirligig, including making a hypothesis, identifying the variables and constants, and listing materials and procedures.

*Day 3 (conducting the experiment):* Students carry out their experiments. They’ll have access to any materials they might need to perform and reflect on the experiment, including:

* The whirligig template on regular copy paper – enough copies for some students to make multiple whirligigs (Some students will be able to use the same whirligig over and over – for instance those who just add more paper clips. Others will need to make several different whirligigs to add length to blades, etc.)
* Paper clips
* Different types of paper with whirligig template photocopied on them (using the types of paper identified in students' plans from the previous day)
* Scissors
* Other materials necessitated by ideas students might have generated that we haven’t thought of
1. **Student support:**

Students with special needs may need modifications, such as help cutting out or putting together the whirligig or access to a scaffolded version of the lab report template.

*Possible formative assessments/supports for all students:*

* Students will be provided a checklist to assess the progress on the project (see attached)
* Teacher will meet informally with students to assess their progress and provide support, as needed
1. **Extensions or variations:**

None provided.

1. **Scoring:**

Student work can be scored using the Whirligig rubric.