Name _____

Remsenburg-Speonk Elementary School

Science Fair Workbook for Grades 4-6

Image from www.4teachers.org

Introduction

This workbook will guide students in grades 4-6 through the Science Fair process and the Scientific Method. It is aligned to the Brookhaven National Lab standards. Included in this packet are the following steps:

1. Topic Selection
2. Testable Question & Purpose
3. Hypothesis
4. Materials
5. Procedure
6. Results
7. Conclusion
8. Presentation

What is the Scientific Method?

Scientists use the scientific method to investigate how things work. Engineers apply the scientific method to make new inventions. The scientific method is a process and way of thinking. It has a set of rules and procedures. It allows other researchers to try your experiment.

Getting Started: Submit Your *Science Fair Contract*

In order to ensure that students perform a true experiment instead of a research report or demonstration, the *Science Fair Contract* asks students to think about three possible topics and evaluate them based on the topic checklist. The timely completion of this contract counts towards report card grades for 5th and 6th grade students.

Once the contract is approved, keep going with the scientific method.

Good luck and have fun!

I wonder…

The scientific method begins with curiosity. What are *you* curious about? Ask questions. Think about ideas and subjects that interest *you*.

While original ideas are best, sometimes inspiration comes while exploring. Below are some resources you can use to come up with ideas.

Books

Museums

Brookhaven National Lab

School & Public Libraries

Family, Friends, & Teachers

Scientists

Recommended Science Fair Websites:

Discovery Education Science Fair Central:
http://school.discoveryeducation.com/sciencefaircentral/

Science Buddies: http://www.sciencebuddies.org

Brookhaven National Lab Elementary Science Fair:
http://www.bnl.gov/education/program.asp?q=175

Library Research

Library Visits

Visit your school and public library. Browse the science books, talk with a librarian, search the catalog, and research online.

Remsenburg-Speonk Library Media Center

- Mondays-Thursdays 8:40-8:50am
- During the school day with permission from your teacher
- By appointment

Westhampton Free Library

- Mondays-Fridays 9:30am-9pm
- Saturdays 9:30am-5pm
- Sundays 12:00-4:00pm

Library Internet Databases

The library purchases subscriptions to online research databases. They are books, magazines, and journals that have gone through a professional editorial process. They are high quality and reliable.

1. Go to www.rsufsd.org
2. Mouse over the library tab
3. Click on Middle School eReference
4. Choose a database
5. Type the school's username (rs), password (lookitup), and enter

1. Go to www.westhamptonlibrary.net
2. Click on the research tab
3. Choose a category
4. Choose a database
5. Enter your library card number, password, and enter

Name _____ Date Due _____

Science Fair Topic Selection Worksheet

List three possible Science Fair topics you may wish to explore.

1. _____

2. _____

3. _____

Topic Checklist

☐ **Purpose**: Why is my topic important?
Does it solve a real-world problem or address an issue that others and I will care about?

☐ **Originality**: How is my project original?
Find out if an experiment like yours has been done before. If so, how can you make yours unique or improve upon what has already been done?

☐ **Materials**: Do I *really* have all the materials that I'll need?
If you're planning to count bacteria or separate germs, then you'll need a microscope that's a lot more powerful than any we have here at school. Where will you find an electron microscope? Brookhaven Laboratories?

☐ **Time**: Do I *really* have enough time to complete this project?
If you're working with plants, then it may already be too late. If you are growing plants or measuring the "life" of something, will you run out of time?

☐ **Testability**: Can my topic be turned into a testable question?
A Science Fair Project is *not* a research report where you can find all the answers by reading. A Science Fair Project is *not* a demonstration, which shows people how something works, like a model of a volcano. A Science Fair Project *is* an experiment that asks "What is the effect of _____ on _____?" Read the workbook section on testable questions to learn more.

After assessing each topic idea with the checklist, now decide which topic will make the best science fair project for you. Which topic did you choose?

_____

Testable Question & Purpose

What interests you? Toy cars? Recycling? Plants? To turn an idea into a true science fair project, you will need to change it into a *testable question*. A testable question leads to an investigation. It creates two variables: One that you will change (*Independent*) and one that you will measure (*Dependent*). You will also need to think about the things that will stay the same (*Control*). It often uses either of the following formats:

- What is the effect of _____ on _____?
- How does _____ affect _____?

In the table below, there are some examples of how testable questions work to set up variables and purpose in a true science experiment. If you want more examples, visit https://school.discoveryeducation.com/sciencefaircentral/Getting-Started/idea-finder.html#env

	Toy Car Example	Recycling Example	Plant Example
Testable Question	What is the effect of ramp height on the distance a toy car will travel?	How does the type of paper effect how long it takes to decompose?	Which soil is best for starting bean seeds inside during winter?
Independent Variable: What is the *one* thing you will change in your experiment?	Ramp height in centimeters (0, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100 cm)	Type of paper (Recycled, Regular)	Soil type (Garden Compost, Peat Moss, Sand, BrandX®, and a mix of all four)
Dependent Variable: What will you measure?	Distance traveled in centimeters	Time it takes to decompose in days	Height of plants in centimeters
Control Variable: What will stay the same?	Car, ramp	Compost bin, temperature	Water, Sunlight, Pot Size, Time
Purpose: Why is your project important?	People drive in cars everyday on highway ramps and the experiment investigates an important law of physics.	Paper can clog up landfills so it is good to know which type will be better for the environment.	Gardeners and farmers help us by growing food. It is important for them know which soil is best for growing their crops.

Name _____ Due Date _____

Testable Question & Purpose Worksheet

Turing your topic idea into a testable question sets the stage for your project. It will become your roadmap. It turns an idea into a true Science Fair Project! So, what does a science fair project look like anyway?

A Science Fair Project is *not* a research report where you can find all the answers by reading a book or website.

A Science Fair Project is *not* a demonstration, which shows how something works, like a model of a volcano.

A Science Fair Project *is* an experiment that asks a testable question, which is often in the following fill-in-the-blank format…

"What is the effect of _____ on _____?"

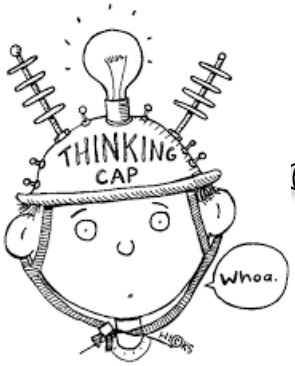
-- OR --

"How does _____ affect _____?"

Write down the *one* thing you will change in your experiment.	Write down what will you measure in your experiment.
This is called the *independent variable*.	This is called the *dependent variable*.

To make sure your experiment is fair, write down the things that you will keep the same during your experiment.

These are called *control variables*.



Purpose

Why is your project important?

Name _____ Date Due _____

Hypothesis Worksheet

What do you think will happen in your science experiment? Make a prediction.

Example:

The higher the ramp, the longer the toy car will travel.

Directions: Write down what do you think will happen in your experiment and why.

_____

_____

_____

_____

_____

_____

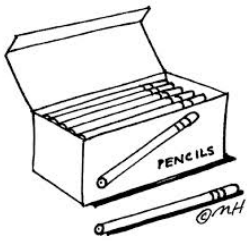
Name _____ Date Due _____

Materials Worksheet

Make a list of everything you need for your science experiment. Notice the use of **metric units** (cm, g, ml, etc.)

Example:

- 5 m long Toy Car Ramp
- Toy Ramp Clamp
- Toy Car
- 1 m high Table Leg
- Meter Stick
- Pencil
- Chart



Directions: Write your materials list on the lines below.

- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____

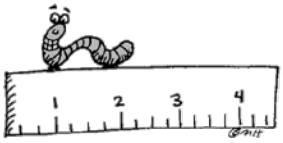
Name _____ Date Due _____

Procedure Worksheet

Write the steps in your science experiment. Start your sentences with verbs.

Example:

1. Clamp one end of the toy ramp onto the table leg at 0 cm high.
2. Place the toy car on the ramp.
3. Release the toy car.
4. Record the distance the car went in the chart.
5. Repeat steps 1-4 with the ramp at different heights.



Directions: Make a numbered list of the steps required to perform your science experiment. Use the back of this page or an additional sheet of paper if necessary.

1. _____

_____

2. _____

_____

3. _____

_____

4. _____

_____

5. _____

_____

Name _____ Date Due _____

Recording Your Results

It's finally time to actually do your experiment! How will you record the results? Think back to the variables in your testable question. What will you change? What will you measure? Use this information to organize your table, chart, notebook, or journal.

Example:

Height of Ramp in Centimeters	Distance Traveled in Centimeters
0	0
10	14
20	23
30	37
40	45
50	61
60	70
70	79
80	88
90	97
100	102

Directions: Design a table or chart on an additional piece of paper or a computer spreadsheet. Remember to include units of measurement. Yours will be unique to your experiment, but it *might* follow this format:

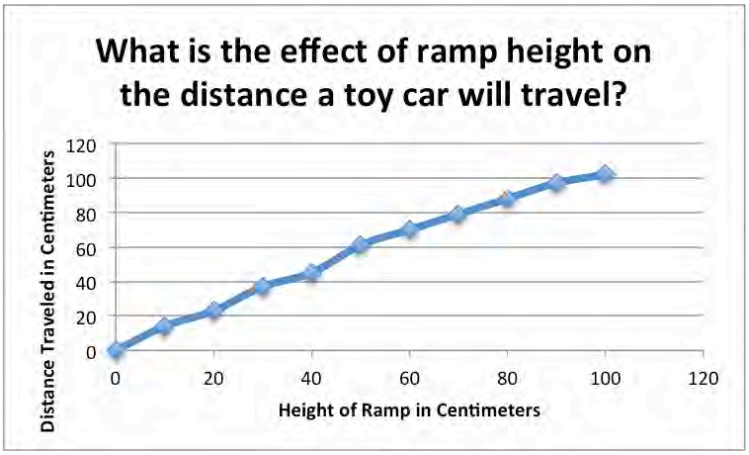
Independent Variable What is being changed?	**Dependent Variable** What is being measured?
Record your data measurements in these boxes.	

Name _____ Date Due _____

Analyzing Your Results

Now that you have collected your data, you need to analyze your results, or look at them for patterns and meaning. Maybe you can do this simply by looking at the data, but you will be able to see it visually if you turn that data into a graph, bar chart, pie chart, pictogram, etc.

Example:



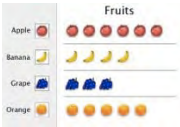
The graph shows that as the height of the ramp increases, the distance the car travels also increases.

Directions: Circle the chart(s) that will best fit your data.

Graph
Or "Lined Scatter" in MS Excel

Bar or Column Chart

Pie Graph



Pictograph

???

Other

_____

Now use graph paper or a computer spreadsheet program to **chart** or **graph** your results for your display board.

Finally, write a **descriptive sentence or paragraph** on a separate piece of paper about your results in order to explain them to your audience.

Name _____ Date Due _____

Conclusion Worksheet

What did you find out? How does it compare with what you thought would happen in your hypothesis? Whether your hypothesis was correct or incorrect does not matter. Either way you have valuable results to report.

Examples:

- The data support the hypothesis that the higher the ramp, the longer the toy car traveled.
- The data do not support the hypothesis that Brand X grew the tallest plants. In the experiment, Brand Y grew the tallest plants.

Directions: Write a sentence or brief paragraph explaining what you found out and if the data supported or did not support your hypothesis.

_____

_____

_____

_____

_____

_____

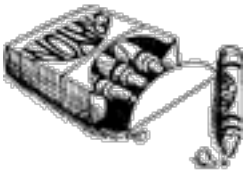
Display Board 

Time to get out your art supplies, scrapbooking tools, and printer! The display board guides your audience through your science fair project. At Remsenburg-Speonk's Science Fair, you will have the opportunity to talk with our students, teachers, and judges. However, at Brookhaven National Lab, students are not present during judging and the display board must speak for your work. This is your audience's first (and sometimes only) impression. Make it count!

- **Purchase a Display Board**: You will need a standard tabletop tri-fold science fair display board (36" x 48"), which is available for purchase at most office supply and craft stores.
- **Sketch a Plan**: Create a "mock-up" first draft of your display board. Proofread to correct any mistakes. Lay everything out before you glue or tape anything down.
- **Create a Title**: Create a "catchy" title to get the viewer's attention. Make it big and center it at the top of your board.
- **Make it Readable**: The display should be readable from several feet away. Use a minimum of 24-point font for headings and 16-point for text blocks, although captions and citations may be smaller.
- **Be Organized**: Organize your board like a newspaper; sections should read from the top to bottom and from left to right. You should include the steps from the scientific method in a logical order.
- **Be Artistic**: Use art and scrapbooking supplies. Make it colorful. Use your charts and graphs. Take photos of your experiment. If you use a picture from the Internet, cite where you found it. Get creative and have fun!
- **Make it 3D**: On the day of the Science Fair, bring in "props" from your experiment that you can show or demonstrate to your audience.
- **BNL Requirements**: Nothing on the project that may identify the child, child's gender or school, including, but not limited to, photos, journals, labels or titles.

Example:

The following page shows the display board from the Toy Car Example. On the day of the Science Fair, the display board would be accompanied by the actual ramp and toy car used in the experiment.



Going the Distance...

Testable Question

What is the effect of ramp height on the distance a toy car will travel?

This is important because people drive in cars everyday on highway ramps and the experiment investigates a law of physics.

Hypothesis

The higher the ramp, the longer the toy car will travel.

Images from www.hotwheels.com

Materials

- 5 m long Toy Ramp
- Toy Ramp Clamp
- Toy Car
- 1 m high Table Leg
- Meter Stick
- Pencil
- Chart

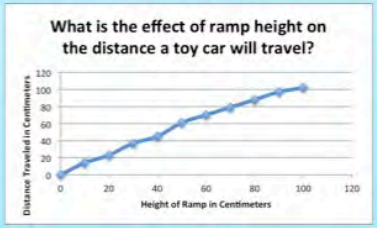
Procedures

1. Clamp one end of the toy ramp onto the table leg at 0 cm high.
2. Place the toy car on the ramp.
3. Release the toy car.
4. Record the distance the car went in the chart.
5. Repeat steps 1-4 with the ramp at different heights.

Results

Height of Ramp in Centimeters	Distance Traveled in Centimeters
0	0
10	14
20	23
30	37
40	45
50	61
60	70
70	79
80	88
90	97
100	102

The graph shows that as the height of the ramp increases, the distance the car travels also increases.



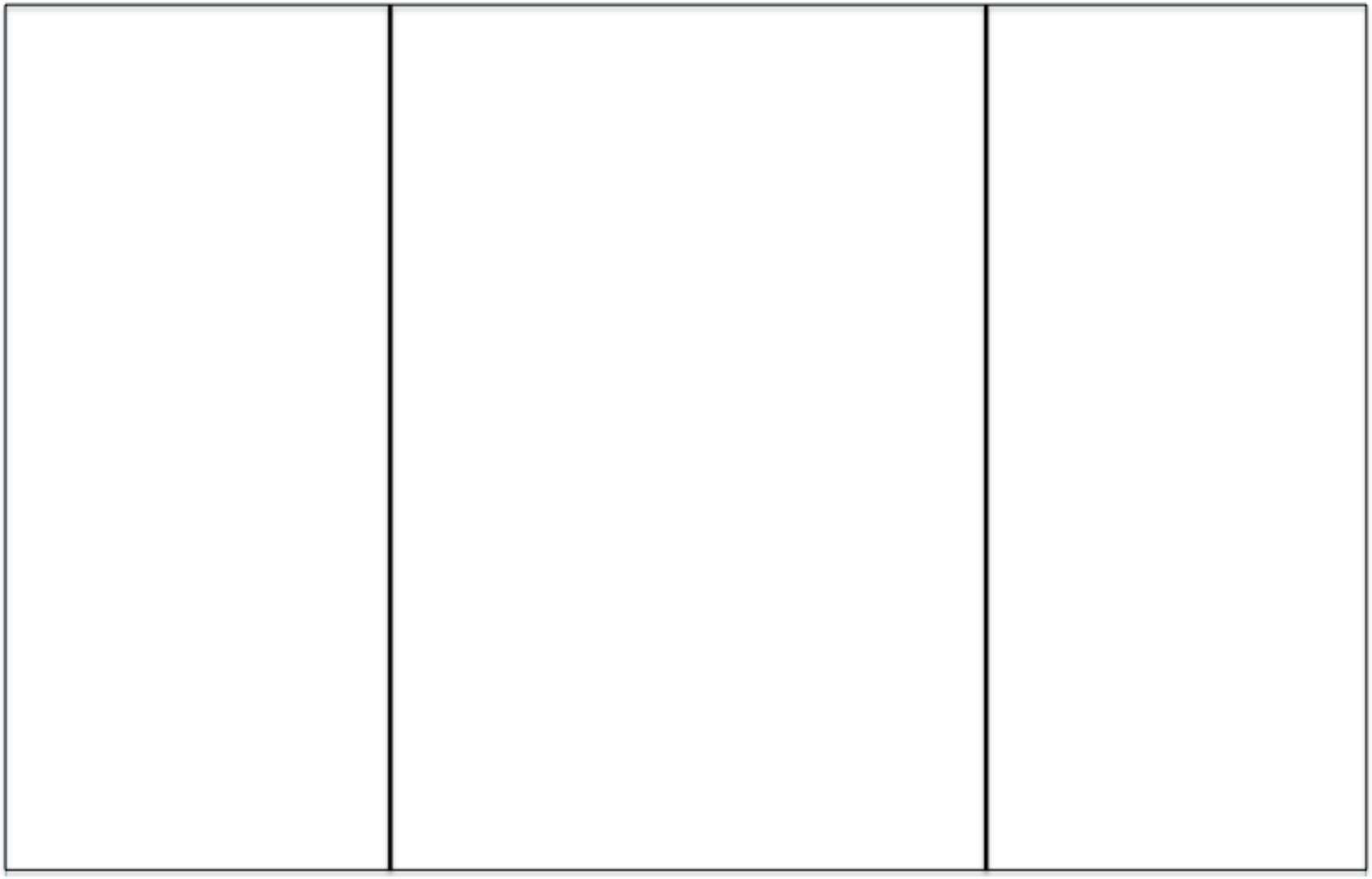
Conclusion

The data supports the hypothesis that the higher the ramp, the longer the toy car traveled.

Name _____ Date Due _____

Display Board Worksheet

Directions: Draw a sketch of your display board layout. Make sure you remember to include all your steps of the scientific method.



Name _____ Date Due _____

Oral Presentation Notecard Worksheet

During the Remsenburg-Speonk Elementary School's Science Fair Day, students in grades 5 and 6 will present their projects to guest judges. Use the notecards for practice only. A good presenter knows his or her information and will not need to use notecards. A good presenter also considers the audience: The judges will want a detailed explanation, but our younger students only need a brief summary. All audiences appreciate speakers who are enthusiastic, animated, and knowledgeable.

Example:

- Importance of Cars & Physics
- Height v. Distance? [point to ramp & car]
- Higher ramp, longer distance [point to graph]
- Hypothesis correct

Directions: Make a bulleted list of important words and ideas from the scientific method. You should also include prompts to help you remember to point out a detail from your display. Write your presentation notes in the space below or on an index card and then practice, practice, practice!

- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____

Name _____

Remsenburg-Speonk Elementary School
Science Fair Workbook for Grades 4-6

Final Checklist

Directions: Check off each task that you have completed to help keep organized.

- ☐ Science Fair Contract
- ☐ Topic Selection
- ☐ Testable Question & Purpose
- ☐ Hypothesis
- ☐ Materials
- ☐ Procedure
- ☐ Results
- ☐ Conclusion
- ☐ Display Board
- ☐ Oral Presentation
- ☐ Self-evaluate your project using the rubric from the Science Fair Webpage. Make corrections if needed.