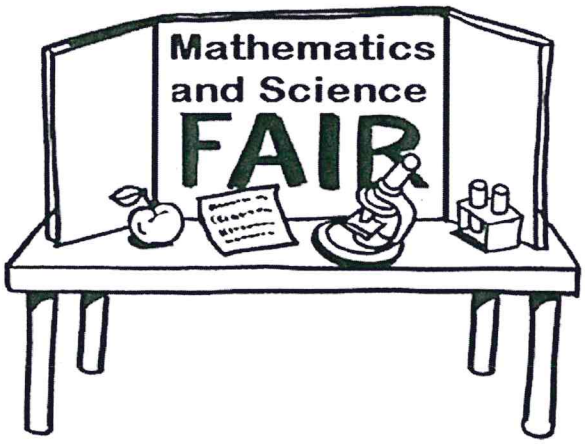
PALM BEACH COUNTY SCHOOL DISTRICT

2017 DISTRICT ELEMENTARY MATHEMATICS, SCIENCE, AND S.T.E.M. FAIR



Student - Parent Guide

THE SCHOOL DISTRICT OF PALM BEACH COUNTY
REACH FOR EXCELLENCE

Student Timeline and Assignments
For Completing School Math and Science Fair

Dear Parent or Guardian,

We will be holding our school science and math fair on March 13, 2017. Participating in a science and math fair is an enjoyable way for students to learn how to conduct experiments to solve problems. Students will make displays that show how they went about conducting their experiments.

This science fair is not quite like the science fairs you may have experienced. While models and modeling are important to science, we are not encouraging students to display models of such things as volcanoes and the solar system. Instead, we are encouraging them to ask questions and then to set up experiments to answer those questions. In this way, they learn to approach science as scientists do.

There are three (3) assignments, to help your child begin planning their investigation, "*My Testable Question*, *My Hypothesis*, and *My Materials and Procedure*." I will explain them to your child, and will need your support in having them complete each assignment and turning them in on time. A calendar of due dates is included to keep them on track.

1) *Help your child select a math or science topic that they are interested in learning more about.*
2) *Work together with them to formulate a testable question, which they can answer (test) by doing an experiment.*
3) *Take them to the library or help them search online for more information about their question. Then read more about it to learn what is already known about the topic.*
4) *Next, help your child plan an experiment that will test their question. Identify what they should look for, observe, and record, as they are conducting their experiment. Help them gather and list, in quantity, all the materials they will need to do their experiment. Write a list of the procedural steps, in the order they will follow them, to do their experiment.*
5) *Once their procedure is approved, help them observe and ask questions as they carry out their experiment, but be careful not to do the experiment for them. Have them repeat their experimental test three (3) times. Guide the process and mentor their progress, do not do the work for them.*
6) *Last, help them gather the supplies they will need to make a display of their projects results. Allow them to put the display together themselves - only offer encouragement not assistance.*

Obviously, the project investigation and display should be your child's own work. This is a good time for you to mentor, encourage, and assist them in completing these assignments. Attached please find a guide to completing a successful project, a timeline of due dates, and the assignments your child needs to complete. If you have any questions, contact me anytime.

Respectfully,

STUDENT - PARENT GUIDE

What are S.T.E.M. themes?

Students can also choose a "S.T.E.M. theme" for their project. There are four S.T.E.M. themes students can choose from:

1. **Aviation** in which they investigate the principals of ***flight or flight safety***.
2. **Green** projects that investigate ***recycling*** *materials,* ***conserving, or preserving resources***.
3. **Physical Science** projects in which a hand-made *(not store bought)* ***mechanical or design engineered part or tool is*** **used to test the hypothesis in an experiment**.
4. **Energy** projects which investigate ***energy*** use or ***energy conservation***.

Projects identified in these "S.T.E.M. theme" topics are judged separately for awards sponsored by our community partners.

All Project Boards Should Include the Following Labeled Steps

1. **Purpose** - a statement explaining what you are trying to investigate. It can also be written as a question. You can also use all or part of your purpose statement/question as the Title of your project. Collect as much information as you can about your investigation. Spend some time in the library or on the internet learning more about it. Your research will help you understand the question a little better and help you write a testable question or "hypothesis" that can be tested by collecting experimental data.
2. **Hypothesis** - a prediction that can be tested by conducting an experiment. A hypothesis is an informed (researched) question. It uses the information you collect about your purpose (statement/question) to explain the observations made before, during, and after doing your experimental test trials.
3. **Materials** - a list of all the equipment and materials you use in your investigation. List each item by quantity, in a column. Use metric tools, measures with units when possible (customary English measuring tools, and measures with units will also be accepted).
4. **Procedure** - a list of all the steps in your experimental trials, in the exact order you perform them. Be clear, but keep it simple. Other scientists should be able to replicate your experimental results by following the same procedures.

Every experiment should have 'control' variables which should always stay the same. Also, there is only one 'dependent' variable which you manipulate to test your hypothesis, and one 'independent' variable which you observe and measure as you experiment. Write a procedure for your experiment. Show it to your teacher. When your teacher has approved your procedure *(for safety or the humane treatment of animal or human subjects),* you may begin experimenting. Repeat your experiment 3 times in trials, or test 3 samples in groups. Record any number data with measurements and/or write any descriptions of observations in a Data Table.

STUDENT - PARENT GUIDE

All Project Boards Should Include ... *(continued)*

5) **DATA TABLE** - a written record of all the observations *(changes)* and measurements made in your experimental trials. It is important to record everything that takes place. Record both qualitative and quantitative descriptions and measurements. Your data should be recorded in a table. Take photographs that show the changes you observe, but **do not** photograph any *human faces (of the investigator or subjects)*. Once you have finished your first experimental trail, run two more trails following the same procedure exactly *(for a minimum of 3 trials)*. If you are testing samples, you must test a new sample each time *(for a minimum of 3 sample-groups).* Make sure to record all numbers with their units of measurements. Be precise in your counting or measuring and accurate with any calculations.

Next compare and contrast your observations. Make as many true statements *(claims)* as possible about your recorded data. Match each claim with some data *(evidence) which* you have recorded. If possible plot any two factors of data *(i.e., size over time, temperature over time)* into a graph. With each graph you make, explain any patterns or trends you observe in the graph. Bar, line, circle, and leaf-plot graphs are all excellent ways to compare and contrast your data.

6) **RELATIONSHIP TO MATHEMATICS** is required only on math projects - and explains any math skills, computations, or processes that were used in your investigation and/or design and engineering process.

7) **CONCLUSIONS** – any true statements/*claims* explaining the results/outcome of your investigation. What data/evidence did you record in your experimental trials that supports each statement? Does your experiment support or reject your hypothesis? What problems, if any, happened during your experimental trials that may have affected your results? All findings should be explained. Any claims you make should be supported by the data recorded in your tables/charts.

8) **REAL LIFE CONNECTIONS** - If applicable, explain any application your project has to real-life or if it has any present or future career opportunities. (*NEW* this year but not scored)

Lay out all of these steps in order so that they read from left to right on your project board. If you are doing the design and engineering process, use the dual labels shown on page 2 under New this year.

All project boards must show the entire investigation process. Because students are **not** present during judging, only the information written and displayed on their project board will communicate what they've learned in their investigation to the judges.

Layout the information for the steps above, in order from 1 through 7 so that it reads from the left-side panel across the middle panel and finally down the right-side panel on the board display.

Before a student is required to do a math or science fair project independently, they should have an opportunity to use the science inquiry process, or math skills that are necessary to complete it. Learners need to follow the steps of the project in order: Purpose, Hypothesis, Materials, Procedure, Data, Relationship-to-Mathematics, Conclusion and Real Life Connections.

School Fair Project Time Line

Date of the School Math and Science Fair March 13 4pm to 6pm

Date	Completed	Things I Need To Do
Oct. 27		Choose a topic, write and submit a *Testable Question*.
Oct. 31		Research the topic using books, the Internet and other resources (like science activity books). Submit any changes in writing to the teacher.
Nov. 7		Write a *Hypothesis Statement* and submit it for approval.
Nov. 14		Design an experiment to test your hypothesis. Write a *Materials List and the Procedure Steps* you will follow and submit them for approval.
over break		Conduct your experiment 3 times (trials) and record your observations and data in a log or your science notebook.
on going		Organize your data into charts or tables. Make one or more graphs that compare or contrast the data. If you are doing a math project, write an explanation of the *Relationships to Math* in your project explaining the math you used to understand your data.
Dec. 16		Write your conclusion. Make sure you match each claim you make with the evidence that justifies it from your data tables or graphs.
over break		Make your project display board. Be careful to follow the exact display board order and then submit it to your teacher.
2/21 → 3/3		Present your project to the class. Be ready to talk about your experiment and what you learned in your investigation.
march 13		Celebrate! Visit the School Fair to view the projects submitted by other students throughout the school.
March 8		Submit first and second place winning school project boards to the School Fair Coordinator for entry into the District Elementary Fair.
May 8		District Fair Set-up and Judging in the South Florida Expo Center.
may 9 & may 10		Visit the District Fair on a school field trip.
May 10		Coordinator returns the projects boards to your class and announces any winners in your school.
May 15		Celebrate! At the School Awards Assembly _____.

STUDENT - PARENT GUIDE

The Classroom Teacher's Role

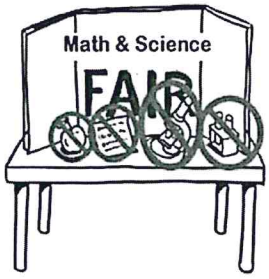
The classroom teacher's role is to model the process and coach their students how to create testable questions. Classroom teachers should provide all the appropriate oversight, guidance, and support the learner needs to succeed. The checklist below lists the classroom teacher's responsibilities.

- ☐ Model the math investigation, science experiment, and design and engineering processes.
- ☐ Provide learners with topic ideas and other idea resources.
- ☐ Assign individual projects.
- ☐ Make certain each idea is appropriate for the learner's grade level and skills.
- ☐ Approve any animal or human subject experiments.
- ☐ Explain the timeline and chunk any assignments by due date.
- ☐ Inform the parents of all expectations and keep them in the communication loop.
- ☐ Provide materials, tools, and an appropriate place to work (if necessary).
- ☐ Provide ongoing instruction and support with fidelity.
- ☐ Show learners how to organize and lay-out their project board.
- ☐ Check the spelling, grammar, skill, accuracy, and content for completeness.
- ☐ Assess the learner's performance.
- ☐ Enter completed projects into your School Fair.

The Parent's Role

Parents play an important role in their child's success in completing a project. The following checklist will assure parents they are not doing too much.

- ☐ Discuss the learning expectations of the project with your child.
- ☐ Review the timeline and assignment due dates.
- ☐ Provide any materials, tools, or resources they need to complete the project.
- ☐ Set a time and quiet place to do the work.
- ☐ Encourage your child to do their best and monitor their progress.
- ☐ Only assist them in completing their assignment, DO NOT DO THE PROJECT FOR THEM.
- ☐ Check their spelling, grammar, skill, accuracy, and content for completeness.
- ☐ Help them to plan and organize the project board layout before gluing anything down.
- ☐ Tell them only paper, pictures, and graphs can go on their boards, no other objects.
- ☐ Help them with suggestions, DO NOT DO THE BOARD FOR THEM.
- ☐ Help deliver their project to school safely by the due date.



Remember!

The project board tells the judges everything that took place in the project investigation process. Students may not be present to explain their work at the School Fair competition and will not be present at the District Fair competition. So, it is very important to include everything needed to clearly understand the project. Research papers, logs, or notebooks are NOT scored in the District Fair and should not be displayed. No models, parts, equipment, or samples are allowed to be displayed either.

Helpful Hints for Students

Math, Science, and Engineering Fair is a competition. Your project should show what you've learned in your investigation. You will learn how to identify a problem, write a hypothesis, and test your hypothesis with an experiment you design and develop. You should observe your variable and your controls, make measurements, and record the data as you repeat your experiment three times. You should organize all your data in tables and analyze the results. Plot and graph the data to compare and contrast your findings if possible. Then write your conclusions explaining what you have learned by doing the project on your display board. Make sure to only make claims that are true, and match them to evidence *(data)* you've observed and recorded in your experimental trials. Write your conclusions in complete sentences.

You can track your progress using the check list below.

Student Check List

- ☐ Pick an interesting topic you want to learn more about. Submit your plan for approval to your teacher. Read and follow your teacher's suggestions and safety precautions carefully.
- ☐ **ALL PROJECTS INVOLVING ANIMALS NEED TO BE APPROVED BEFORE EXPERIMENTING** begins.
- ☐ **ALL HUMAN SUBJECT EXPERIMENTS NEED TO BE APPROVED BEFORE EXPERIMENTING** begins.
- ☐ Write your purpose. State what problem *(or question)* you are going to investigate.
- ☐ Research your topic. Use your textbook and the internet to read more about your problem. Think about an experiment you could do to learn more about your problem.
- ☐ Write a hypothesis. Explaining what you are trying to test in your experiments.
- ☐ List the materials. Make a list of the things you use to do your experiment. Use measuring tools if to make some of your observations and record them in tables in your notebook.
- ☐ Plan your experiment. Write a step-by-step procedure *(recipe)*. Think of all the things you will "observe that change" in your experiment. These things are called *variables (things that change)*. Pick one that you think supports your hypothesis and develop a procedure to test it.
- ☐ Next, think about all the "other variables" in your experiment that could change. Develop steps to keep them from changing? Record how you will measure and monitor them. The variables you keep from changing in your experiment become your *controls (variables that do not change)*. An experimental test procedure has one variable that will change and all the other variables are controlled.
- ☐ Begin your investigation. As you run your experimental test trials, observe all the changes that happen to your test variable. Record everything you observe in a log book. Keep accurate and precise measurements of what happens *(quantitative observations).* Organize your data in tables.
- ☐ Describe any other changes you observe using all your senses. What do you see, hear, smell, feel, or taste? *(qualitative observations)* Record everything you sense and measure.
- ☐ Repeat your experiment with fresh materials at least 3 times *(trials).* Record each set of data for each additional experimental trail. Don't change anything in your procedure.
- ☐ Organize your data into tables. Add units to all your number data across all 3 trials. Plot and Graph any data you can to visually compare and contrast what has happened. Explain any trends *(patterns)* you see in your graph.
- ☐ Record your conclusions. Do your results support your hypothesis? If not, why not? Don't change you data, just explain your results. What claims can you make based on the data? It's not about right or wrong, it's about what your data supports or rejects. Report your results truthfully. Just list the facts.
- ☐ Match each claim *(true statement)* with evidence *(data)* you recorded. Explain the data that supports each claim. Describe why your results are important, what they mean, and why they are significant. You may also explain how the problem you investigated applies to real-life.

Project Board Layout

PROJECT TITLE

PURPOSE

A **PURPOSE** is a statement explaining what you are trying to investigate. It can also be written as a question. You can also use all or part of your purpose statement/question as the title of your project.

HYPOTHESIS

THE **HYPOTHESIS** is a prediction that can be tested by conducting an experiment. It uses the information you collect about your purpose to explain the observations made before, during, and after doing your experimental test trials.

MATERIALS

MATERIALS are a list of all the equipment and materials you use in your investigation. List each item by quantity. Use metric tools, measures with units when possible (customary English measuring tools, and measures with units will also be accepted).

PROCEDURE

THE **PROCEDURE** is a list of all the steps in your experimental trials, in the exact order you perform them. Be clear, but keep it simple. Other scientists should be able to replicate your experimental results by following the same procedures.

THIS AREA IS FOR –

Photographs that show the changes you observe or the steps in your procedure. DO NOT photograph any human faces.

Drawings of your observations or projects designs.

Graphs or other analysis of your data.

DATA TABLE

DATA is a written record of all the observations and measurements made in your experimental trials organized in tables or charts. It is important to record everything that takes place. Record qualitative and quantitative descriptions and measurements with units. Run a minimum of 3 trials that follow the same procedure. If testing samples, test each sample a minimum of 3 times as well.

RELATIONSHIP TO MATH

Is REQUIRED on all math projects. Explain any math skills, computations, or processes that were used in your investigation.

CONCLUSION

CONCLUSIONS are true statements explaining the results/outcome of your investigation. What evidence did you discover in your experimental trials that supports each statement? Do they support or reject your hypothesis?

Science Fair Project Ideas

Plants

How does light affect plant growth?
How does color affect the growth rate of plants?
How does temperature affect seed germination?
Is spacing important when growing radish seeds?
How does magnetism affect the height of bean seeds?
How does acid rain affect the growth of rye grass?
Do different types of soil effect how well a plant grows?
Does how deep you plant a seed effect its rate of germination?
Does salinity affect a plant's growth?
Does acid rain affect a plants leaves?
What effect do detergents have on growing bean seeds?
Does gravity effect the roots of a plant?
Does temperature effect the ripening time of a banana?

Animals

How does temperature affect the activity of meal worms?
Does the amount of food affect mealworm population growth?
How do different color lights affect an earthworm's behavior?
How do bright lights affect cricket behavior?
Do background colors affect a chameleon?
What effect does temperature have on goldfish?
How do different levels of salinity affect brine shrimp population?
How do snails respond to different pH liquids?
Do vibrations affect the behavior of ants?
Does the height of a bird feeder change how many birds use it?

Human Body

Who has bigger hands/feet, boys or girls?
Who is taller, boys or girls?
Who has more lung capacity, boys or girls?
How does vision effect your taste?
How does age effect your reaction time?
How does age effect hearing?
How does age effect smell?
How does exercise change your pulse rate/or blood pressure?
What is the effect of walking/skipping/running on your heart rate?
How does left/right handedness change your reaction time?
How does the amount of light change your vision?
Does color affect how food/beverages taste?
Does listening to different music affect mental performance tasks?
Does watching T.V. affect how fast you complete a puzzle?

Earth & Space

Does the sun rise at the same time/in the same location every day?
Are the hours of daylight and night the same year round?
Does the moon rise at the same time/in the same location every night?
Does freezing change rocks?
Do different soils drain the same amount of water?
How do different types of ground cover effect soil erosion?
What is the effect of the wind on bare soil?
Does temperature effect crystal growth?
Does air temperature effect the evaporation of water?
Does air pollution have an effect on precipitation?

MORE SCIENCE FAIR IDEAS

EARTH & SPACE *(continued)*

Does the length of a wing change the flight of a paper airplane?
Does soil color effect how it heats-up?
How does the change in season effect the temperature of water?
How does humidity effect evaporation?
Can acid rain effect statues made of stone?
How do shadows change over time?
Does the angle of sunlight effect soil/water temperatures?
Do different surfaces absorb the same amount of energy?

PHYSICAL

What is the effect differently shaped prisms on the production of a color spectrum?
What effect does lens shape have on the refraction of light?
How do color light filters affect perception of color of objects?
How does length, tension, or mass of a guitar string affect the pitch of sound?
How do different solids affect the transmission of sound?
How does the length of a vibrating body affect the sound?
How well do different solids *(wood, plastic, metal)* conduct heat?
What is the effect of temperature on the volume of air?
What is the effect of heat on different liquids?
Do different insulating materials affect heat loss/gain of water?
How does the color of an object change the amount of heat it will absorb?
Can red cabbage juice measure the pH of household liquids?
How does the strength of a magnet change through different materials *(glass, cardboard, paper)*?
What is the best shape for a kite?
How is the distance a skateboard rolls affected by the mass of the skateboard?
Does wattage affect the heat from an incandescent light bulb?
Can different fabrics change heat loss/gain?
Does temperature change the height a ball will bounce?
Do the way mini-lamps are connected in a circuit affect the brightness of their bulbs?
Do the number of batteries and the how they are connected affect the strength of an electromagnet?
Do the number of wire wraps around the nail of an electromagnet change its strength?
Does the size of the iron nail of an electromagnet change its strength?
How does the mass of an object affect its buoyancy?

ENVIRONMENTAL *(Green)*

Does recycling change the amount of wastes that goes to the landfill?
What materials that are thrown away at home could be reused at school for learning projects?
How do oil spills affect feathered animals, furry animals, fish, sand, or shellfish?
Which plant and food wastes breakdown best in a compost bin?
Which native plants attract hummingbirds, butterflies, or more birds into an environment?
Which native plants need less irrigation water and provide more color to a landscape?
What natural remedies are effective at controlling harmful insect that attack garden plants?
What native plants can be introduced into irrigation ponds to promote aquatic habitats?
What steps can be taken at home or school to reduce the trash sent to the landfill?
What can you do to reduce electrical energy consumption in your home or school?
What can be done to stop wasting water at home or school?

MATH FAIR PROJECT IDEAS

A good math project should solve a problem or answer a question using math skills or principles. Here are some interesting ideas you might want to investigate.

Do numbers and symbols really help people communicate?
What are magic squares?
What are Napier rods?
Is probability affected by the number of sides on a die?
What are triangular and square numbers?
How does temperature affect the state of matter?
Roman Numerals vs. Arabic Numbers, What's on Your Watch?
Can practicing math facts improve test scores?
Where's the math in computer languages?
Where is the math in Music?
What are Tangrams?
Stock Market Math
What are "Big Numbers?"
How are fractions used in advertising?
What's symmetry in nature?
End of Days, When does your calendars end?
Is 666 really a part of every barcode number?
Are there ordered pairs in art?
What is a number's divisibility?
Switch-on, Switch-off, Binary Number computing
Unplugged calculations, how does an Abacus work?
What are Catalan numbers?
Why have Time Zones?
What are Fibonacci numbers?
That's the least of your Number Coin problems
Can an Almanac accurately predict the weather?
What is the Golden Mean?
Could there be a North American Euro?
Is your Bank ATM's, FREE or FEE?
Are some Unit Prices more attractive than others?
Does daylight savings time work for you?
How can you measure a planet?
What in Your Wallet? Cash, Debit, or Credit

Name _____ Date _____

My Testable Question

My project is about *(What is the Purpose of your project?)*

My testable question is *(What is your Hypothesis?)*

The data I will be recording are *(What changes will you be observing – What will you measure?)*

Teacher approval and comments

Name _____ Date _____

My Hypothesis Statement

My project hypothesis is *(Must be testable - Should state a cause and effect.)*

I already know *(Background I learned from, books, or the Internet.)*

I want to learn *(What I want to test.)*

Teacher approval and comments

Name _____ Date _____

My Materials and Procedures

I will use these materials in my experiments *(List all materials by quantity and any tools you need.)*

I will follow these steps to do my experiments *(Number each step in the exact order it is done.)*

I will observe these changes *(list the **variables** you will test and the other variables you will **control** to keep them from changing in your experiment and the data and measurements you will be collect and record)*

Teacher approval and comments