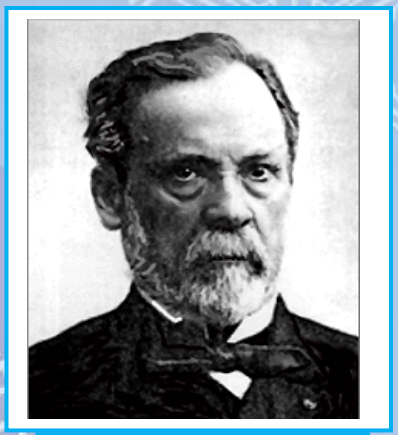
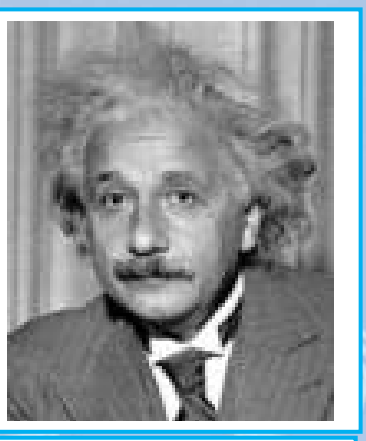
Sir Isaac Newton



Louis Pasteur



Albert Einstein

A SCIENCE Winter Inquiry Land

Grade 8

Winter 2011-2012

Miami-Dade County Public Schools
Curriculum & Instruction

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TABLE OF CONTENTS

WELCOME TO *A SCIENCE WINTER INQUIRY LAND*

Preparing for Science

Science is not something mysterious. Being "scientific" involves being curious, observing, asking how things happen, and learning how to find the answers. Curiosity is natural to children, but they need help understanding how to make sense of what they see.

Bruno V. Manno
Acting Assistant Secretary
Office of Educational Research and Improvement

Many people are frightened by science and see it as something that can only be understood by the mind of a genius. Increasing the number of people going into the fields of science and mathematics is the national goal. However, even if a student is not planning to pursue a career in one of those fields, they have to be prepared to live and work in a world that is becoming increasingly complex and technical.

What Is Science?

Science is not just a collection of facts. Facts are a part of science. However, science is much more. It includes:

- Observing what is happening,
- Predicting what might happen,
- Testing predictions under controlled conditions to see if they are correct,
- Trying to make sense of our observations, and
- Involving trial and error--trying, failing, and trying again.

Science does not provide all the answers. The world around us is always changing and we learn something new every day, so we have to be willing to make changes and adjustments to our knowledge when we discover something new.

The Winter Break Packet

The activities and reading passages in this packet were selected to allow students to experience the relevancy of science in a fun and engaging way. As they navigate through these activities, students should realize that science is not limited to the classroom but that it is all around in everyday lives and that it explains most of the phenomena encountered in life.

Included as part of this packet, is a link to the Miami-Dade County Public Schools Student Portal *Links to Learning* technology activities. Individualized student learning paths have been designed based on FCAT scores and are aligned to the District's Pacing Guides. These online activities are supplemental and, as such, are not to be assigned or graded. All online activities are provided as a resource to both parents and students to engage learning using technology. Please log on just as you do at your school http://www.dadeschools.net/students.asp .

Safety First

Read through each activity before you try it. Adult supervision is important, especially with any of the activities that involve heat, chemicals or sharp instruments.
Also, make sure that you understand any safety precautions that may be necessary for these—or any—science activities. In particular, you should:

- Taste nothing without adult supervision;
- Wear goggles whenever something could splash, burn, or shatter and endanger eyes;
- Follow warnings on manufacturers' labels and instructions for toys and science kits;
- Avoid toxic or other dangerous substances;
- Avoid accidents; and
- Know what to do if an accident occurs.

Enjoy!

Who Were They?

Sir Isaac Newton was a physicist, mathematician, astronomer, alchemist, and natural philosopher. He is best known for his explanation of Universal Gravitation and the three laws of motion. He was also able to prove that the reason of both the motion of objects on Earth and of celestial bodies is controlled by the same Neutral laws. These findings would make a revolutionary change in the development of science. His invention of the reflecting telescope was his great contribution in optics.

Louis Pasteur was a French chemist and microbiologists and one of the most famous and influential contributors in medical science. He is remembered for his remarkable breakthroughs in the causes and preventions of diseases supported by his experiments on the germ theory of disease. He also created the first vaccine for rabies and anthrax. Pasteur also invented the method of "pasteurization", where harmful microbes are stopped from causing sickness in food.

Albert Einstein is the greatest scientist of the twentieth century and the most notable physicist of all time. He was born in Germany but eventually migrated to America to take a teaching position at Princeton University. It is told that he had a learning disability in his childhood. He could not talk till he was three and could not read till he was eight. Despite such problems, in 1921 he became the noble prize winner for his contributions to Physics. His *Theory of Relativity* is considered a revolutionary development of Physics.

Sinking and Floating Soda Cans

Adapted from: http://www.sciencefairprojects-ideas.com

Directions: Read through the activity for "Sinking and Floating Soda Cans." Next, complete the experimental design worksheet. Following the experimental design worksheet, conduct the experiment. Last, write your conclusion, using the 7 conclusion questions as your guide.

Imagine a hot summer day. You're at a picnic and go to the ice chest where the sodas are staying nice and cool. Which cans are floating in the ice water, and which have sunk to the bottom?

For this experiment you will need:

• several unopened cans of regular soda of different varieties
• several unopened cans of diet soda of different varieties
• a large aquarium or sink

Procedures

1. Fill the aquarium or sink almost to the top with water.
2. Place a can of regular soda into the water. Make sure that no air bubbles are trapped under the can when you place it in the water.
3. Create a chart.
4. Record your observations in the chart. Does it sink or float?
5. Repeat the experiment with a can of diet soda.
6. Record your observations in the chart. Does it sink or float?
7. Repeat the experiment two more times.
8. Complete the Experimental Design and Writing Conclusions questions on the next page.

Think about it

1. Why does one can sink, and the other can float?
2. Take a look at the nutrition facts on each can of soda. Write your observations.

Experimental Diagram

Title:	
Type of Investigation *(controlled experiment, observation)*	
Problem Statement *(Can be written as a question)*	
Hypothesis: (explanation to the Problem statement – should be written as an IF – THEN – BECAUSE statement)	
Test/Independent Variable:	
Outcome/Dependent Variable:	
Experimental Tests:	
Number of Trials per Test: *(repetition)*	
Control Test:	
Variables Held Constant:	

Writing Your Conclusion

Directions: Write your conclusion within three paragraphs. Answer questions 1-3 in the introduction paragraph, question 4 in the body paragraph, and questions 5-7 in the conclusion paragraph.

1. What was investigated? (Describe the problem statement)
2. Was the hypothesis supported by the data?
3. What were the major findings?
4. How did your findings compare with other researchers?
5. What possible explanations can you offer for your findings?
6. What recommendations do you have for further study and for improving the experiment?
7. What are some possible applications of the experiment?

Benchmark(s):
SC.8.P.8.4 Classify and compare substances on the basis of characteristic physical properties that can be demonstrated or measured; for example, density, thermal or electrical conductivity, solubility, magnetic properties, melting and boiling points, and know that these properties are independent of the amount of the sample. (Also assesses SC.8.P.8.3.)

Content Cluster: Physical Science

HOLE-Y WATER

Adapted from: http://www.billnye.com/for-kids-teachers/home-demo-details/

Everything around us is made of atoms and molecules. Surprisingly, atoms and molecules are made up mostly of empty space.

Here's a simple experiment to prove that a glass of water molecules contains a whole lot of nothing. Well, a lot of space.

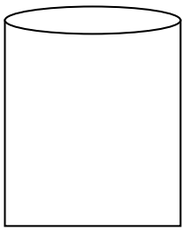
What you need:
1. Powdered sugar
2. A cup of hot water
3. A teaspoon

What you do:
1. Fill the cup to the brim with hot tap water. Get the surface to bulge above the rim.
2. Without dipping the teaspoon in the water, CAREFULLY add a teaspoon of sugar to the water.
3. Repeat several times.

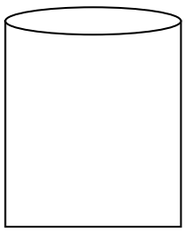
What's happening?
The sugar molecules dissolve and fit into the empty spaces between the water molecules. That's why the water in the cup doesn't spill out. Matter is overflowing with empty space.

HOLE-Y WATER ACTIVITY PAGE

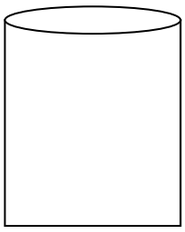
Imagine that we could magnify a glass of water so that we could actually see the hydrogen (H) and Oxygen (O) atoms combined as a water molecule (H_2O). In the space below, draw what you would see in the glass before heating, after heating and when the sugar particles are mixed with the water.



Water molecules in glass before heating



Water molecules in glass after heating



Sugar molecules with water molecules in the glass

Explain what happened to the water molecules when they were heated.
(Think about what heat does to the movement of atoms and molecules)

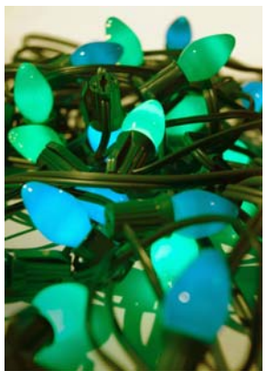
Repeat the experiment with cold water. Were you able to add more or less sugar to the glass?

Explain your results

Benchmark(s):
SC.8.P.8.5 Recognize that there are a finite number of elements and that their atoms combine in a multitude of ways to produce compounds that make up all of the living and nonliving things that we encounter. (Also assesses SC.8.P.8.1, SC.8.P.8.6, SC.8.P.8.7, SC.8.P.8.8, and SC.8.P.8.9.)

Content Cluster: Physical Science

ENERGY – IT'S FLOWING ALL AROUND US!



1. Create a foldable identifying the main components that make mini-lights work.

2. During the vacation, take a walk around your home, neighborhood or the mall; look carefully at the mini-lights that decorate homes and trees. Design a poster labeling and explaining the flow of energy through a string of holiday lights that decorate a home or neighborhood. Be sure to include the many forms of energy transformations involved in the decorative displays. Present this poster to family and friends. There should be <u>at least</u> three forms of energy identified and discussed from the list below and whether the form is kinetic or potential and their possible sources.

<u>Forms</u>
- Nuclear energy
- Radiant energy
- Thermal energy
- Electrical energy

<u>Sources</u>
- Solar
- Hydroelectric
- Wind
- Oil
- Coal
- Natural gas
- Uranium

Hints:
- Call your local electric power plant
- Research online: http://www.eia.gov/kids/energy.cfm?page=about_forms_of_energy-basics

Benchmark(s):
SC.8.N.1.6 Understand that scientific investigations involve the collection of relevant empirical evidence, the use of logical reasoning, and the application of imagination in devising hypotheses, predictions, explanations and models to make sense of the collected evidence.

Content Cluster: Physical Science

SEEN ON THE SCIENCE FAIR SCENE

http://www.sciencenewsforkids.org/articles/20071010/Feature1.asp

Answer the following questions before reading:

1. What kinds of people like to participate in science fairs?
2. How might a science fair change a student's life?
3. Have you competed in science fairs? If so, what did you enjoy most about the experience? What was challenging about it?

During reading, find the answers to the following:

1. Name two types of opportunities mentioned in this article that science fair participants might get to experience.
2. How did Sasha become interested in growing plants on Mars?
3. What are some of the obstacles to growing plants on Mars?
4. How have computers helped Nick with his project?
5. What do all of Nick's projects have in common?
6. What has Nick discovered through his science fair projects?
7. This article describes a number of young scientists. Their projects tackle a variety of subjects. What do they all have in common?

Benchmark(s):
SC.8.N.1.1 Define a problem from the eighth grade curriculum using appropriate reference materials to support scientific understanding, plan and carry out scientific investigations of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions. (Also assesses SC.6.N.1.1, SC.6.N.1.3, SC.7.N.1.1, SC.7.N.1.3, SC.7.N.1.4, SC.8.N.1.3, and SC.8.N.1.4.)

Reporting Category: Nature of Science

SEEN ON THE SCIENCE FAIR SCENE

http://www.sciencenewsforkids.org/2007/10/seen-on-the-science-fair-scene-2/

READING SELECTION

By: Emily Sohn

Every spring, more than 1,000 high school students from around the world compete for millions of dollars in scholarships and other prizes at the Intel International Science and Engineering Fair (ISEF). But prizes aren't the competition's only draw.

Science projects are great opportunities to build real-life research experience. And once students experience science fair success, they have opportunities to travel. Along the way, they make friends whom they often see from one competition to the next.

At the 2007 ISEF in Albuquerque, N.M., for example, 25 of the 1,500-plus participants were once finalists in the Discovery Channel Young Scientist Challenge (DCYSC), which is held in Washington, D.C. every fall.

Nick Ekladyous (far left) and teammates explored Albert Einstein's theory of relativity at the DCYSC in 2004. Richard Cho, DCYSC

At DCYSC, 40 of the nation's top middle school science students work in groups to tackle challenges with a scientific theme. They are judged on their problem-solving, teamwork, and communication skills.

Their experiences at DCYSC, say these 25 science fair veterans, have served them well at ISEF.

"DCYSC helped us learn how to present our ideas to adults," says Sasha Rohret, a 17-year-old senior at the Keystone School in San Antonio, Texas.

At ISEF 2007, Sasha presented the results of her ongoing research on the possibility of growing plants on Mars. Emily Sohn

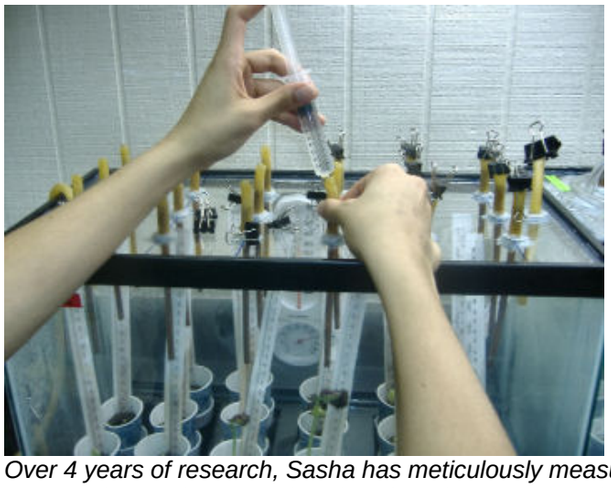
"I [also] got a lot of experience with the scientific method," she says. "I had to work in groups with people I didn't know."

From science fairs to Mars

At this year's ISEF, Sasha presented the results of her 4-year (and counting) study that explores the possibility of growing plants on Mars. She got the idea after seeing a television program about the Mars rovers, robotic spacecraft that landed on the Red Planet in 2004. Sasha was an eighth-grader at the time.

The program said that if people ever wanted to live on Mars, they would need to learn how to grow food there. The idea captured Sasha's imagination, and her work on the subject has already earned her one trip to DCYSC and three trips to ISEF.

For her experiments, Sasha has grown plants in volcanic soil that resembles Martian soil. She puts the plants in airtight, gas-filled tanks that mimic the atmospheres of Mars and Earth.



Over 4 years of research, Sasha has meticulously measured how plants might grow on the Red Planet under a variety of soil and atmospheric conditions. Courtesy of Sasha Rohret

Over the years, she has discovered that the relatively large proportion of carbon dioxide (CO_2) in the Martian atmosphere is the biggest obstacle to growing plants there. The gas makes up about 97 percent of Mars' atmosphere, compared with less than 0.05 percent of the atmosphere on Earth.

Mars' atmosphere is also thinner than Earth's, so more of the sun's radiation hits Mars' surface, Sasha says. Extra radiation is tough on plants.

"You would have to alter the Martian atmosphere quite a bit to grow plants on Mars," Sasha concludes. However, she remains optimistic. "I think it will happen."

Some day, Sasha would like to be an astrophysicist—an astronomer who specializes in the physical and chemical properties of objects in outer space. And if she ever gets an invitation to explore Mars, she'll leap at the chance.

"I would go if I had the opportunity," she says. "I think it would be pretty fun."

Science students to the rescue
The science fair veterans in Albuquerque tackled a diverse range of subjects, from botany to mechanical engineering. One thing that many of the projects had in common was their attempt to solve important, real-world problems.

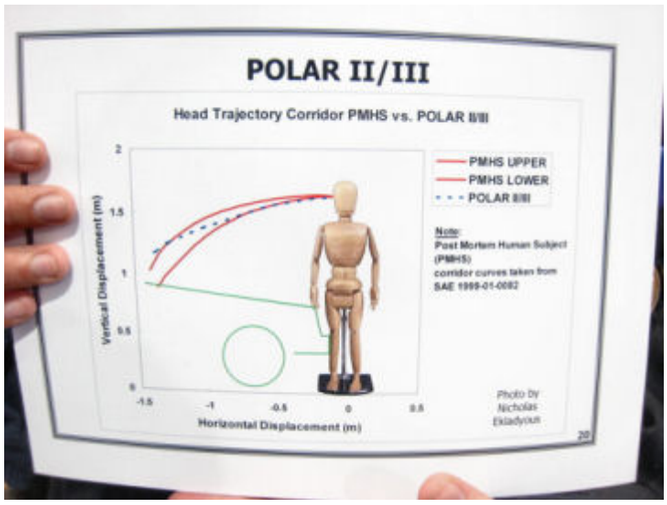
"I always try to do a project every year that will impact society in a positive way," says Nicholas Ekladyous, 15, now a senior at Cranbrook Kingswood Upper School in Bloomfield Hills, Michigan.

At ISEF this year, Nick stood with a crash-test dummy and presented his work on van safety. Emily Sohn

For his eighth- and ninth-grade projects, Nick aimed to make 15-passenger vans safer. He built a scaled-down model of such a van and then designed a computer program to predict when a real van would be most likely to roll over. The 2-year project earned him a trip to DCYSC in 2004 and to ISEF in 2005.

As a sophomore in 2006, Nick attended ISEF with his design of a safer material for padding playground floors. Finally, for ISEF 2007, Nick used computer models to develop a design for car hoods that would be less harmful to pedestrians struck in traffic accidents.

"If pedestrians are hit, the chances of death are very high," Nick says.



For his 2007 ISEF project, Nick created a computer program to model how badly pedestrians would be injured when struck by cars with a variety of hood designs. Emily Sohn

According to Nick, his hood would reduce death and injury to pedestrians by as much as 70 percent compared with current models. He has filed for a patent on his design.

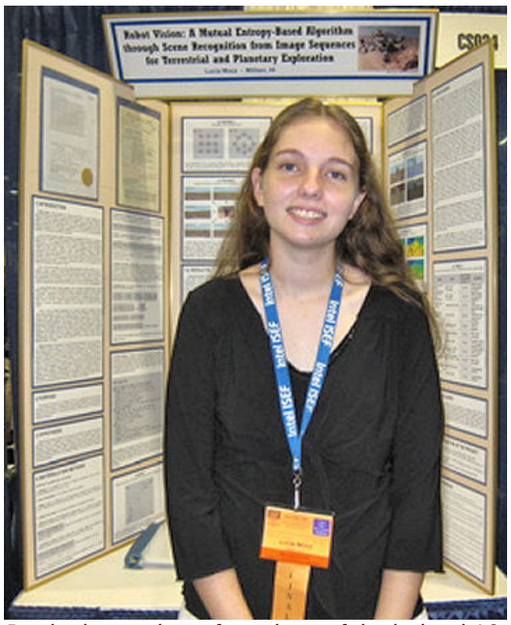
Lessons learned

The exhibition hall at ISEF can be an intimidating place, filled with row after row of projects with hard-to-pronounce names. Still, the DCYSC veterans seemed to be enjoying the scene—sometimes to their surprise.

In the exhibit hall at ISEF each year, more than 1,500 students display the results of work that touches on nearly every topic in science. Intel

"DCYSC was the first time I got to go to a national competition," says 16-year-old Lucia Mocz, who conducted her first science fair project in middle school only because it was a class requirement. Lucia is now a junior at Mililani High School in Hawaii.

"That was a major force in getting me interested in science," she says. "I did not like science before, but [DCYSC] was just so fun. Now, I want to major in math."



Designing projects for science fairs helped 16-year-old Lucia discover a love of math. Emily Sohn

Want to experience the science fair scene? First, find a topic you're passionate about, suggest the DCYSC/ISEF veterans. Then, let the investigations begin.

After reading, answer the following questions:

1. Does this article help you think in new ways about your own science fair projects? Why or why not?
2. Veterans of DCYSC and ISEF recommend that you "find a topic you're passionate about." Make a list of 10 subjects or ideas that you are passionate about. Choose one item on the list and explain how you could turn it into a science project.
3. Compare Nick's projects with Sasha's project. Which do you think is more important or more interesting? Which do you think is better? Explain your reasoning.
4. Nick likes to study topics "that will impact society in a positive way." What is another safety issue that he could look at for his next project? How might he design a project to study this issue?
5. Based on their current interests, what kinds of careers might Sasha and Nick want to pursue in the future?
6. Do you think science fairs can be negative experiences for some people? If so, how?
7. Sasha says, "I [also] got a lot of experience [from science fairs] with the scientific method." What does Sasha mean by the "scientific method?"

SOCIAL STUDIES

How might your city, state, or country inspire or influence your science fair project?

LANGUAGE ARTS

1. Create five questions you would ask a science fair winner if you were going to interview him or her?
2. How might books help you work on your science projects? How could you use the Internet to your advantage?

MATHEMATICS

In the year 2000, 5,870 pedestrians died in motor vehicle accidents in the United States. Nick claims that his hood design would reduce those types of deaths by 70 percent. Compared to the 2000 statistics, how

many fewer pedestrian deaths would there be in the U.S. each year if all cars on the road used Nick's hood design instead of the traditional design?

Now that you are an expert on the science fair, see if you can find all the terms that make the fair a “dream” in the following word search.

FAIR DREAMS

U B V E T E R A N S T P I S R
Y T E F A S X Y R O V E R S E
E T G P T C H A L L E N G E S
N E D I X O I D N O B R A C E
O A J H U M Q P E F A V C C A
M M O S A M E E U X T O S U R
O W N R I U X D Q I M L Y S C
O O S A L N P E R P O C C C H
I R O L D I E S E P S A D E U
F K U O A C R T U D P N B A G
Z C N H E A I R Q A H O C L I
F S S C Z T E I U I E E A U J
E A Z S I I N A B C R C J M X
S B I O R O C N L U E R P N K
I V N R P N E S A L O H C I N

ALBUQUERQUE
ALUMNI
ATMOSPHERE
CARBON DIOXIDE
CHALLENGES
COMMUNICATION
COMPETITION
DCYSC
EXPERIENCE
FAIR
ISEF
LUCIA
MARS
MONEY
NICHOLAS
PEDESTRIAN
PRIZE
RESEARCH
ROVERS
SAFETY
SASHA
SCHOLARSHIP
SUCCESS
TEAMWORK
VETERANS
VOLCANO

From Science News for Kids Oct. 10, 2007.
http://www.sciencenewsforkids.org/2007/10/seen-on-the-science-fair-scene-2/
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Do not miss the Miami-Dade County Regional International Science and Engineering Fair at the STEM EXPO held on the Miami Dade College North Campus, January 21, 2012

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The School Board of Miami-Dade County, Florida adheres to a policy of nondiscrimination in employment and educational programs/activities and strives affirmatively to provide equal opportunity for all as required by law:

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Title VII of the Civil Rights Act of 1964, as amended - prohibits discrimination in employment on the basis of race, color, religion, gender, or national origin.

Title IX of the Educational Amendments of 1972 - prohibits discrimination on the basis of gender.

Age Discrimination in Employment Act of 1967 (ADEA), as amended - prohibits discrimination on the basis of age with respect to individuals who are at least 40.

The Equal Pay Act of 1963, as amended - prohibits gender discrimination in payment of wages to women and men performing substantially equal work in the same establishment.

Section 504 of the Rehabilitation Act of 1973 - prohibits discrimination against the disabled.

Americans with Disabilities Act of 1990 (ADA) - prohibits discrimination against individuals with disabilities in employment, public service, public accommodations and telecommunications.

The Family and Medical Leave Act of 1993 (FMLA) - requires covered employers to provide up to 12 weeks of unpaid, job-protected leave to “eligible” employees for certain family and medical reasons.

The Pregnancy Discrimination Act of 1978 - prohibits discrimination in employment on the basis of pregnancy, childbirth, or related medical conditions.

Florida Educational Equity Act (FEEA) - prohibits discrimination on the basis of race, gender, national origin, marital status, or handicap against a student or employee.

Florida Civil Rights Act of 1992 - secures for all individuals within the state freedom from discrimination because of race, color, religion, sex, national origin, age, handicap, or marital status.

Veterans are provided re-employment rights in accordance with P.L. 93-508 (Federal Law) and Section 295.07 (Florida Statutes), which stipulates categorical preferences for employment.

Revised 9/2008