



S+T+E+M = success

A focus on science, technology, engineering and mathematics education is what STEM is all about. Francis Eberle, Ph.D., the executive director for the National Science Teachers Association, notes, "A successful STEM education provides students with science, math and engineering/technology in sequences that build upon each other and can be used with real-world applications."

STEM education creates critical thinkers, increases science literacy and enables the next generation of innovators, according to Eberle. The morning crew at Bay News 9 uses science, technology, math and engineering every day to bring you weather, traffic and breaking news.

Watch Bay News 9 and go to baynews9.com. Make a list of all of the different ways science, technology, engineering and math are used at the television station. Then read the electronic edition of the *Tampa Bay Times* and make a list of all of the examples of science, technology, engineering and math you can find. Share what you discover with your class.



Weather can be mysterious, exciting and sometimes dangerous. That's why Bay News 9 created Project Weather to help provide kids with the information they need to stay safe. Project Weather is made up of interactive educational resources to help prepare students for the future.

Students will need skills in science, technology, engineering or math for 80 percent of jobs in the next 10 years. Therefore, educating kids about weather sciences is the perfect subject for the Bay News 9 weather experts! The Project Weather Scholarship Contest is a one-time award of \$1,000 presented to seven high school seniors who excel in science. The scholarship is granted as a part of Bay News 9's commitment to educating children about science and weather. For more information, go to baynews9.com/projectweather.



Chuck Henson, traffic reporter
"Technology, math and science are part of my job at Bay News 9. Every day, we tap into the Internet and build maps and charts which only exist in the virtual reality called television. Imagine the process of putting a helicopter in the air, equipping it with a camera and somehow magically bringing those images into your home. Now multiply that by the hundreds of other things that need to happen at the same time—a perfect combination of people and technology. It can blow your mind! Engineers and programmers make it possible. The incredible team at Bay News 9 works with the technology to bring your morning news to you every day!"



Juli Marquez, meteorologist
"From tracking hurricanes to forecasting cold fronts, how do I use STEM for my job as morning meteorologist? Every day, when you're talking about the weather! The weather technology has continued to change and improve in many ways: from the computer models we look at when making our forecasts to the technology of Klystron 9, the world's most powerful television radar. The tools we use in the Weather on the Nines Forecast Center are constantly upgraded and improved to bring you the best weather forecast we can every day, rain or shine."

"When I visit Tampa Bay-area classrooms, I always talk about the importance of studying math and science. There are so many exciting and important careers built on math and science. Meteorology is just one of them. I hope you enjoy it as much as I do!"



Erica Riggins, news anchor
"I discovered my love for engineering and math as a teenager. I was fascinated with the idea of designing products to make people's lives better. I knew that technology was the key to creating an easier and more comfortable way of life in our communities. It's a belief that led me to get a degree in mechanical engineering. I spent nearly 10 years working for a high-tech company and watching those engineering designs improve our quality of life."

"Now I use journalism to help make people's lives better and safer, and my problem-solving skills from those old engineering days are a big part of my daily news routine. Engineers are taught to attack problems from every possible angle to find the best solution. It's a mindset that I apply to news stories and issues within our communities. Our stories also require significant research, analysis and critical thinking to study and present the problem, along with possible solutions, to our viewers. Again, more problem-solving skills that my engineering background helped strengthen."

Learning with the Times

Controlling weather

From rain dances performed by Native Americans to seeding clouds with dry ice to make hail form and fall quickly, the idea of controlling the weather has appealed to a lot of people. Research ways people try to control the weather. Then look for newspaper stories about and advertisements for events that could be affected by the weather. Look for such things as sports competitions, farming activities or political events. If you could control the weather for each event, what conditions would you prescribe? How might ideal weather for that event interfere with other activities? Discuss these points with your class.

Climate change
No one can say what the future holds with global warming. But it's clear we need to think ahead. Research global warming and climate change. Look for articles in the *Tampa Bay Times* on this subject. Then decide whether you think it is a serious problem. Write an editorial or letter to the editor outlining your thoughts. Be sure to use specific examples from the research you have done to support your ideas.

Working together
The meteorologists and reporters at Bay News 9 work every day to get the weather and community news to you so you can be prepared. Check out the information about them on Baynews9.com and watch them on the air. What skills, interests and knowledge does a successful reporter or meteorologist have? Using news articles in the *Tampa Bay Times* as models, write a summary of these skills in the form of a short news article.

BAY NEWS 9 project weather



Exclusively on **bright house** NETWORKS

The wonderful world of weather

Weather is all around us. Weather is what the air is like in any one place at any one time. How hot or cold is the air? How much dampness, or moisture, is in the air? How fast is the air moving? How heavily does the air press on the earth?

Weather is what happens in the air from minute to minute. The weather can change a lot within a very short time, especially in Florida. For example, it may rain for an hour and then become sunny and clear.

Weather is what we hear about on the television news throughout the day or see online or read about in the newspaper. Weather includes daily changes in precipitation (rain), barometric pressure, temperature and wind conditions in a given location. Weather is fueled by the sun. Other factors also affect weather, such as friction, or resistance, between the land and sea; the rotation of the earth; and the shifting of wind. These cycles and forces create complex and ever-changing patterns.

Weather is the way water changes in the air. Without water, there would be no

clouds, rain, snow, thunder or fog. In fact, weather affects our lives and all things on Earth, plays a big part in our lives and affects many of the things that we do.

Sources: United States Environmental Protection Agency and ThinkQuest

Weather vs. climate

A measure of time is the difference between weather and climate. Weather is what conditions of the atmosphere are over a short period of time. Climate is how the atmosphere acts, or behaves, over relatively long periods of time.

When people on the news talk about climate change, they are referring to changes of long-term averages of daily weather. Milder winters and hotter summers are indicators of climate change. In some parts of the world, people have noticed that springtime comes earlier now than it did 30 years ago. This is another indication of climate change.

Source: NASA



This publication incorporates the following Sunshine State Standards: Science: SC.3.N.1.1-7; SC.3.N.3.1-3; SC.4.N.1.1-8; SC.5.N.1.1-6; SC.5.N.2.1-2; SC.5.E.7.3-7
Language Arts/Reading: LA.3.1.4.1-4 LA.3.1.5.1-2; LA.3.1.6.1-10; LA.3.1.7.1-8; LA.3.2.2.1-4; LA.3.3.1.1-3; LA.3.3.2.1-2; LA.3.3.3.1-4; LA.3.3.4.1-6; LA.3.4.2.1-2; LA.3.5.1.1; LA.3.5.2.1; LA.3.6.1.1; LA.3.6.3.1-2; LA.3.6.4.1; LA.4.1.4.1-3; LA.4.1.5.1-2; LA.4.1.6.1-10; LA.4.1.7.1-8; LA.4.2.2.-2; LA.4.3.1.1-3; LA.4.3.2.1-3; LA.4.3.3.1-4; LA.4.3.4.1-6; LA.4.4.2.1-2; LA.4.5.1.1; LA.4.5.2.1-5; LA.4.6.1.1; LA.4.6.3.1-2; LA.5.1.4.1-3; LA.5.1.5.1-2; LA.5.1.6.1-11; LA.5.1.7.1-8; LA.5.2.2.1-4; LA.5.3.1.1-3; LA.5.3.2.1-3; LA.5.3.3.1-4; LA.5.3.4.1-5; LA.5.4.2.1-2; LA.5.5.1.1; LA.5.5.2.1-2; LA.5.6.3.1-2

This publication incorporates the following Common Core requirements: RI.3.1; .RI.3.2; RI.3.3; RI.3.7; RI.4.1; RI.4.2; RI.4.3; RI.4.7; RI.5.1; RI.5.2; RI.5.3; W.3.1a; W.3.1b; W.3.7; W.4.1a; W.4.1b; W.4.7; W.5.1a; W.5.1b; W.5.7; SL.3.1; SL.3.4; SL.4.1; SL.4.4; SL.5.1; SL.5.4

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WEEKEND FORECAST

FRI



SUNNY

75°

SAT



PARTLY CLOUDY

66°

SUN



FEW SHOWERS

60°

The most **ADVANCED** weather radar

Klystron 9 is the most advanced and powerful TV weather radar, and Bay News 9 has the only privately owned weather radar in the world with a Klystron tube.

According to Bay News 9 meteorologist Mike Clay, "The Klystron tube gives our radar the ability to operate as a Doppler radar 24/7.

Other radars built for TV stations can't do that. We also use the power we are able to create with the Klystron tube to make this radar the most powerful owned by any TV station. Our 1.25 million watts of peak power is unmatched in the industry."

Klystron 9 is also the first dual-polarization radar in Florida. "Dual-pol" provides more details about the amount of rain falling, the type of precipitation falling and any hail that might be falling from a storm.

Another feature unique to Klystron 9 is called pulse compression. Clay says, "We can electronically take the powerful signal already used by our radar and make it even stronger by using a computer to change the pulse length. Pulse compression has been used for years, but Klystron 9 is the first high-power TV station radar to use this technique to make an even stronger signal."

Remember, though, you can't just depend on computers and technology alone for weather reports. Bay News 9 has a staff of experienced meteorologists who have worked in the Tampa Bay area for years and are familiar with the region's unique climate and weather patterns.



Predicting the WEATHER

Radar is an electronic instrument that determines the direction and distance of objects that reflect radio energy back to the radar site. Radar stands for radio detection and ranging. Doppler radar detects precipitation intensity, wind direction and speed, and provides estimates of hail size and rainfall amounts.



Weather system

A front is a weather system.

A front is a boundary separating two different types of air.

Usually, one type of air is more compressed, or denser, than the other. Different temperatures and levels of humidity cause this denseness. When the two types of air meet, a conflict arises. This conflict, or clash, of air types causes weather: rain, snow, cold and hot temperatures and wind.

There are two major types of fronts: cold fronts and warm fronts.

COLD FRONTS often accompany thunderstorms or other types of extreme weather. They usually travel from west to east. Cold fronts move faster than warm fronts because

cold air has more molecules of material than warm air. That makes the cold air denser. When cold air meets warm air, the denser cold air lifts the warm air. This is known as a low-pressure system. Low-pressure systems often cause severe rainfall or thunderstorms.

WARM FRONTS usually show up after precipitation (rain, sleet, hail, snow) and fog. As they pass cold air masses, warm fronts move slowly, usually from north to south. Warm fronts are less dense than cold fronts, so they often bring with them milder and long-lasting weather patterns. Warm fronts are linked with high-pressure systems, where warm air is pressed close to the ground. High-pressure systems usually indicate calm, clear weather.

Source: National Geographic

Learning with the Times

The effects of natural disasters

Weather and natural disasters affect our daily lives, health and economy. Many natural disasters occur only in certain parts of the world, but their occurrences can have an impact on the lives of those who have not experienced firsthand the drama and tragedy accompanying these events. Use the *Tampa Bay Times* to keep track of natural disasters during the next month. Keep a natural disaster journal. In your journal, identify each disaster and its location. Create a chart listing all of the natural disasters. Choose a disaster that did not happen in your area and make a list of some of the ways in which you or other people in your community would be affected by this particular kind of disaster. Write a brief essay outlining the disasters and how they affect communities. Share your information with your class.



Newspaper in Education

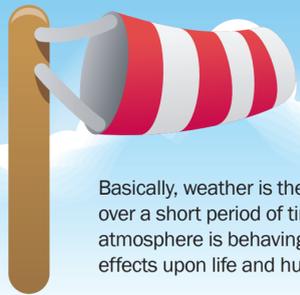
The *Tampa Bay Times* is one of nearly 1,000 U.S. newspapers offering "a living textbook," the daily newspaper, to teachers and students. The NIE program provides Tampa Bay-area classrooms with newspapers and curricula for students, teacher support, classroom activities and a library of resource materials – at no cost to the teachers.

Our mission is to support the educational communities of the Tampa Bay area by promoting literacy and readership while we continue to make a difference in the lives of countless students by providing up-to-the-minute resources.

The Tampa Bay Times NIE program invites businesses, organizations and individuals to underwrite the classroom delivery of the *Times* through our sponsorship program. You will gain great exposure to students, families and teachers. Most of all, you will be helping to prepare our future workforce by improving reading and thinking skills. Reading increases vocabulary, writing skills and knowledge of the world around us.

For information about the Times NIE program, call 727-893-8138 or 800-333-7505, ext. 8138, or visit tampabay.com/nie. Follow us on Twitter at [Twitter.com/TBTimesNIE](https://twitter.com/TBTimesNIE).

Atmospheric conditions



Basically, weather is the condition of the atmosphere over a short period of time. Weather is the way the atmosphere is behaving, mainly with respect to its effects upon life and human activities.

Most people think of weather in terms of temperature, humidity, precipitation, cloudiness, brightness, visibility, wind and atmospheric pressure, as in high and low pressure.

In most places, weather can change from minute to minute, hour to hour, day to day and season to season.

In the Tampa Bay area, weather can change from city to city and county to county. There are a lot of parts to weather. In Florida, weather includes sunshine, rain, cloud cover, wind, hail, flooding, thunderstorms, steady rains from a cold front or warm front, excessive heat, heat waves and more.

Source: NASA

Lightning

As Benjamin Franklin discovered, lightning is a form of electricity. Lightning is created when cold air and warm air meet. The cold air has ice crystals. The warm air has water droplets.

When the warm air rises, thunderstorm clouds are created. During the storm, the droplets and crystals bump together and move apart in the air. This rubbing makes static electrical charges in the clouds.

Just like a battery, these clouds have a positive and negative end. The positive charges in the cloud are at the top. The negative charges are at the bottom. When the charge at the bottom gets strong enough, the cloud lets out energy. The energy goes through the air to a place that has the opposite charge.

This lightning bolt of energy that is let out is called a leader stroke. The stroke can go from the cloud to the ground. Or, a leader stroke can go from the cloud to another cloud. The main bolt or stroke will go back up to the cloud. It will make a flash of lightning and heat the air.

Source: NASA

Learning with the Times

Stormy weather = stormy mood

Weather affects our lives in many ways. We check the weather forecast in the *Tampa Bay Times* each day, and we keep track of weather bulletins and alerts. Throughout the month, keep a journal of your thoughts about the weather's effects on your life. Be sure to include how different weather conditions change your moods and affect your day-to-day plans. Create a feature article for the *Times* to show the connection between weather and moods. Share what you have learned with your classmates and family.

Thunder

A lightning bolt takes only a few thousandths of a second to split through the air. Although the loud thunder that follows the lightning bolt is commonly said to come from the bolt itself, the grumbles and growls we hear in thunderstorms actually come from the rapid expansion of the air surrounding the lightning bolt.

As lightning connects to the ground from the clouds, a second stroke of lightning will return from the ground to the clouds. When that happens, the heat from the electricity of this return stroke raises the temperature of the surrounding air to around 48,632 degrees Fahrenheit. Since this happens so quickly, the heated air has no time to expand.

The heated air is compressed, and then it explodes outward, forming a shock wave of compressed particles in every direction, which, in turn, creates a loud, booming burst of noise.

Source: Library of Congress

Rain and floods

Water droplets form from warm air. As the warm air rises in the sky, the air cools. Warm air holds quite a bit of water. That is why the air feels wet, or humid, in the summer. When enough of these droplets collect together, we see them as clouds. If the clouds are big enough and have enough water droplets, the droplets bang together and form even bigger drops. Once the drops get heavy, they fall because of gravity, and then we have rain.

Not including wind-driven rain, raindrops fall between 7 and 18 miles per hour in still air. The range in speed depends on the size of the raindrop. When there is wind or a great deal of heavy rain, flooding can result. Clogged drains in the streets and overflowing rivers and lakes cause floods.

When the flooding happens quickly, it is called a flash flood. Flash floods are the No.1 weather-related killer in the United States. Most deaths due to flooding in the United States are due to people driving their cars into flooded areas. It may only take 12 to 16 inches of water to cause a car to float!

Source: Florida Division of Emergency Management



Tornadoes and waterspouts

A tornado, or twister, is a powerful column of winds twisting around a center of low atmospheric pressure. A tornado looks like a large funnel; the narrow end moves over the earth.

The powerful winds inside a tornado spiral upward and inward. These winds create a vacuum that sucks up anything the tornado passes over. When the funnel touches a structure, such as a house or car, the strong winds have the ability to tear it apart. The winds inside a twister can reach speeds of up to 500 miles an hour.

A waterspout occurs when a tornado forms over a body of water. Water spouts form when high layers of cool air meet warm moist air from a body of water. Winds within a waterspout can spin around at 60-120 miles an hour.

Source: ThinkQuest

Cold precipitation

Although we do not see a lot of freezing temperatures in the Tampa Bay area, atmospheric conditions below 32 degrees Fahrenheit (F) are possible. When the air temperature becomes colder, precipitation begins to solidify.

Sleet is frozen precipitation that falls as ice pellets.

Hail is a form of precipitation that occurs when updrafts in thunderstorms carry raindrops upward into extremely cold areas of the atmosphere, where they freeze into ice. Hail is larger than sleet, and forms only in thunderstorms.

Freezing rain falls just like normal rain only it freezes on contact with roads, trees, power lines and other structures if temperatures are 32 degrees F or below at the surface.

Snow is commonly formed high in the atmosphere when water vapor changes directly to ice without first becoming a liquid. This happens when the temperature is below 32 degrees F.

Frost is white ice crystals that form on a surface, such as the ground, leaves of a plant or a car. Frost is created when the air temperature drops below freezing and the water vapor in the air freezes into ice crystals.

Source: Weather Wiz Kids

Learning with the Times

Being prepared

One good thing about hurricanes is that we have plenty of advance warning when a hurricane is on the way. Pretend you are preparing for a hurricane or a storm that's approaching your area. Go through the advertisements in the *Tampa Bay Times* and find products you would need to stock up on. Remember the essentials as well as the "comforts" you might need if displaced or without power and supplies for several days. Create a poster with the items you find. Share the poster with your class.



Hot weather safety tips

When hot weather and high heat index values are in the forecast, just remember to drink water:

- Dress appropriately
- Remain inside if possible
- Drink plenty of water
- Never leave anyone in a car with no air conditioning
- Keep outdoor activities scheduled during cooler parts of the day
- Wear a hat and sunglasses
- Always keep an eye on children and the elderly
- Take frequent breaks
- Eliminate strenuous outdoor activities
- Remember to check on pets

Source: Florida Division of Emergency Management



WEATHER experiments



Measuring moisture

Measuring the amount of moisture, or humidity, in the air can tell you if precipitation is likely. Hygrometers measure relative humidity, the amount of moisture in the air. You can make a simple one with a milk carton.

Materials needed

- Two room thermometers
- A small strip of cotton cloth
- Thread
- A 1-quart milk carton
- Rubber bands
- Scissors

Directions

1. First, make sure the two thermometers show the same temperature.
2. Cover the bulb of one thermometer with a 2-inch piece of cotton fabric (a handkerchief will work). Attach the thermometers to different sides of the milk carton with rubber bands.
3. Cut a small hole in the carton just below the thermometer with the covered bulb.
4. Push the tail of cotton through the hole.
5. Put enough water in the carton to reach the level of the hole and keep the cotton wet.

Wait a few minutes before reading both thermometers. The wet-bulb thermometer should have a lower reading. Water evaporating from the cloth uses up heat, causing the temperature to drop. The water will continue to evaporate as long as the air can hold more moisture. Dry air can take on more moisture than air that's already humid. Therefore, the drier the air, the farther apart the two temperature readings will be. If they are the same, humidity is 100 percent. Warm air holds more moisture than cool air. When the air has as much moisture as it can hold at a particular temperature, relative humidity is 100 percent.

Cloud formation

Clouds are formed when water vapor condenses, or squeezes, into water droplets or ice crystals as warm air rises and cools. There are many types of clouds, and you can tell a lot about the weather by observing them. You can make your own cloud.

Materials:

- A large bottle or gallon jug (with cap)
- A friend to help
- A bicycle pump
- A match
- A scrap of paper
- A nail
- 1/4 cup water

Directions:

1. Put the 1/4 cup of water in the bottle or jug. Leave the water in the jug for several minutes to allow some evaporation.
2. Using a nail, punch holes in the cap. Overlap the holes to make an opening about 1/4 inch in diameter.
3. With an adult's supervision, use the match to set fire to the scrap of paper. Blow out the fire and immediately put the smoking paper into the jug.

Place the cap upside down on the bottle. Hold the end of the bicycle pump hose tightly against the cap and push down, so there is a tight fit.

Have your friend make two or three strokes (no more) on the pump. Then quickly release the cap. You'll hear a pop, and a cloud will form inside the bottle.

When you compress the air inside the bottle, it gets warmer and can hold more water vapor. When you release the pressure, the air expands and becomes cooler. It can't hold as much vapor, so droplets form on particles in the smoke, creating a cloud.

Source: *Understanding the World of Weather* published by KRP.



Weather Experts



Josh Linker, meteorologist

"Some people say 'give it 5 minutes and the weather will change'. That is what I love about forecasting the weather in Florida, especially during the summer. Sure, we may say, scattered thunderstorms every day, but it is during the afternoons, when those storms are first forming, that figuring out exactly where they will go and how strong they may be is very challenging and exciting. Watching simple things like the wind direction or the sea breeze influence the daily thunderstorms is very interesting. The small things that make a huge difference in Florida's weather add to the challenge. That is what I really enjoy about Florida weather forecasting."



Diane Kacmarik, meteorologist

"People who don't live in Florida probably think that the weather here is the same all the time. Every day is a challenge in forecasting. The large scale patterns don't change a whole lot in one season, but it is the small scale changes that affect our forecast. No two days are the same when it comes to the forecast. Just when we think we have a handle on it, the storms pop up at a different time or in a different place than the day before. There is always more to learn about how the atmosphere works with the Gulf, Tampa Bay and the shape of our coastline."



Brian McClure, meteorologist

"What most people don't know is that predicting weather in Florida is very challenging. Most of my relatives from other states always joke that it's easy to predict sunshine and highs in the 90s every day. For us that live here, we know it's not that simple. So the thing I like most about forecasting weather here is the pure challenge. Predicting the weather here is more challenging than most places in the entire country. We have to understand how the Gulf, Atlantic and Bay all affect our local weather. The water plays a huge role in what our forecast will be in all seasons of the year. We also have to understand how the weather to our south in the Caribbean can impact our local forecast. These are all things that a rest of the country doesn't have to worry about."



Mike Clay, chief meteorologist

"Florida weather is always changing and because we live an outdoor lifestyle the forecast is important to everyone. Although the weather might seem the same in the summer, with heat and humidity and a daily chance of rain. I've been here for 15 summers and I haven't seen a boring pattern that doesn't change yet. There are always small scale changes to who gets rain and what time of day. Because we are deep in the tropics, these changes are tough to forecast. We are surrounded by water and the computer models don't do as well here as they would in other parts of the country. Local knowledge and experience are very important. It takes at least 5 years to get used to our climate and become an experienced forecaster, it isn't like any other part of the country."



Juli Marquez, meteorologist

"I like that we live in a part of the country where the weather is different from every other state! Florida's winter months can be beautiful with sunshine and pleasantly cool days. We talk about cold fronts and let you know about any chilly mornings in the forecast. The summer is a whole different story. It's hot and humid every day. During our rainy season, we talk about sea breezes and thunderstorms. Using Klystron 9, we can track those storms and tell you if they are severe and how much rain to expect. Of course, hurricane season provides its own set of challenges. From June 1 to November 30 we bring you the Tropical Update every hour of every day. There is a great responsibility that comes with tracking a hurricane or tropical storm and its potential impacts on the Tampa Bay area. Here in Florida, there are times when the weather can be serious and other days when we can enjoy the beautiful weather!"

The five Ps of cold-weather safety

PROTECT PEOPLE: Remember to dress in layers and wear a hat and gloves. It is important to try to stay out of the wind and to stay dry.

PROTECT PETS: If cold weather is in the forecast, be sure to bring outdoor pets inside or give them a warm shelter to stay in.

PROTECT PLANTS: Cover cold-sensitive plants to protect them from the dangerous temperatures.

PROTECT PIPES: Cover pipes and allow outdoor faucets to slowly drip to prevent them from freezing and breaking.

PRACTICE FIRE SAFETY: Use safe heating sources indoors. Do not use fuel-burning devices such as grills; they release carbon monoxide, which is a deadly gas. Also, make sure to use space heaters according to their instructions and be attentive to open flames.

Source: Florida Division of Emergency Management