

Teaching Science

with Stories



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Tales with Tails Storytelling Programs

www.naturestory.com

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USING STORIES TO TEACH SCIENCE

“Science, by its own definition, doesn’t give us meaning. It just provides us with facts . . . Our lives gain meaning only when we tell our story. What the various religious traditions have done over the millennia is to tell the (universe’s) story.” –David Steindl-Rast

Stories and Science?

As both a scientist and a storyteller, people sometimes ask me which field is most important. To those questions, I always answer "yes." Traditional stories and research-based science have at their hearts the same basic goal: finding truth. But they each use different tools and different languages to get there. I see research-based science and metaphorical stories as the two legs of our understanding. Take away either one and our understanding topples to the ground.

Folktales and personal stories use a metaphorical truth to help us connect to and care about our world. They answer our "why" and "so what?" questions with metaphorical and symbolic answers that connect with our emotions. Research-based science answers our "how" questions and speaks to the logical side of our brains.

In the classroom, you can use stories to introduce a topic, hook listeners and demonstrate abstract ideas. In addition to being an effective teaching tool, you will also discover that telling stories is fun for both the listeners and the teller and after a long day of classes, what teacher couldn't use a little more fun in the classroom?

DEFINITIONS

But before we get started, we need to make sure we know what we are talking about.

Story: a narrative of an actual, fictional, legendary or mythic event

Storytelling: the act of using voice and body language to communicate a narrative directly from one person to another.

In my mind, storytelling is much more than just words or gestures. In the process of telling a story, a storyteller takes the mental images from her head, translates them into words and body language, and then transmits them to the minds of her listeners. Storytelling is actually an act of co-creation. The teller transmits the images, but the listeners have an even more important part. They create the story pictures in their own minds. As the audience reacts to a story, a storyteller adjusts the story making each telling of a tale a unique, living experience.

Environmental Story: a narrative that either teaches something about the animals, plants and natural wonders of our world, or that teaches an environmental education concept like diversity, sustainability, food chains or adaptations

WHY TELL STORIES IN SCIENCE CLASS?

A story can “hook” students’ attention. A story is a natural lure for students. Almost instinctively, they want to know how the story ends and they will remember that story more than almost anything else that you say that day.

Stories can give students a “mental organizer.” Since human brains are built to remember stories, any information presented in a story form is easier to remember than a random list of facts. Once a student has heard a folktale about how bear got a stumpy tail, that story creates a "bear file folder" in the listeners mind. Now when they hear bear biology facts, they can put it into their "bear file" and remember is more easily because it is linked to an enjoyable bear folktale.

In many cases, difficult science concepts like “carrying capacity” or “diversity is the key to stability” in ecology are easier to demonstrate in the form of the story.

A story helps students “change gears.” When you change from science lecture to a story, its gives students a chance to rest the logical side of their brains and engage the creative, imaginative side of their brains. This is important for the problem-solving aspects of science. Remember that Albert Einstein said, “Imagination is more important than knowledge.”

Storytelling is an effective way to teach lessons. Human brains seem to retain material put in story form much better than a list of unrelated facts (Haven, 2000) and (Weaver, 1994).

Storytelling is a gentle and effective way to pass on lessons and values. "One upon a time..." is far more powerful than "You really should..." When someone gives you advice, especially unsolicited advice, what's your reaction? To get defensive, put up barriers and ignore the command. If on the other hand, we hear a story about a foolish bear and what happened to him in a similar situation, we are much more likely to heed the warning.

Storytelling helps to build bridges between people and the natural world. Just as stories can help people empathize with people who are different from themselves, stories can also help listeners develop empathy for the animals and plants that share our world. I began looking at deer in a whole new way when I learned a story about how deer got its antlers. I began thinking of animals and plants less as objects and more as community members and neighbors.

Storytelling is fun. It is a captivating, economical, non-electronic form of entertainment accessible to most people regardless of income or educational level. This is the primary reason that most people tell and listen to stories. We enjoy the experience.

KINDS OF STORIES

Now that you are plunging into the world of storytelling and know some of the definitions, you should become familiar with the kinds of stories you will find here. This section acts as a map through the landscape of storytelling.

Fable or Anecdote-A short story that contains a clear moral or message. While earlier versions of "Aesop's Fables" always ended a story with the phrase, "The moral of the story is..." modern storytellers seldom pound the moral into their listeners' ears. If a story is a good story, you don't need the moral to be directly stated to get the point of the story. Aesop's Fables are the best-known collection of fables.

Folktale-The term "folktale" is sometimes a catch-all term for traditional stories told by "the people" (or folk). More specifically, folktales are similar to fairy tales in that they are longer stories. But these stories don't involve supernatural intervention. "Little Red Riding Hood" or the "Three Billy Goats Gruff" are examples of folktales.

"Why" or Pourquoi Stories- "Why" stories are stories that explain how things got to be the way they are. Stories that explain how bear got a short tail or why rabbits have long ears are examples of "why" stories.

Personal Stories-Stories of something that happened to you or your family. While these stories are based on factual events, a storyteller might "improve upon" facts to make a narrative flow better. This doesn't make it a fictional story; it is merely "creative nonfiction." Remember that a story can be "true" even if every element isn't perfectly "factual."

Histories-Personal stories that happened to someone that we don't know personally. While some high school history teachers will teach history as if it is an endless series of dates and rulers, my favorite history teacher just told us stories about the people that made up European history. Historians sometimes get nervous when someone takes history and turns it into a narrative. Storytellers have to make some assumptions when telling a story, but by putting the "story" back in "history" they help listeners care about what happened in England in 1066 or why our government invented the Social Security system.

HOW TO TELL STORIES

You might be happy to realize that you already tell stories. If you are a human being, you probably tell stories. Now you may not think of the narratives you tell as "stories," but that is exactly what they are. Everyone is born with the tools to tell stories. Some people decide that they want to tell stories as a job, or as part of their "day job" at a school, library, clinic or consulting service. Others share stories with their families and friends. Like any other skill or art form, the more you do it, the better you get.

If you are a beginning, the most important thing is that you give yourself license to tell stories. Remember that while it seems like it is a great leap to go from a story listener to a storyteller, it is really only a distance of about three inches: the distance from ear to mouth, and the great thing is that a good story will carry you over that distance with ease.

Finding a Story

There are many good resources for environmental stories. Start with the stories that you already know. How can those stories help you to teach about nature?

Visit your library. Section 398.2 under the Dewey Decimal system, and the children's section J398.2 have great story resources. Look for science stories at www.naturestory.com, including the searchable Environmental Story Database. You can also visit the National Storytelling Network website at www.storynet.org, the site has links to story websites.

Look for stories that "grab" you, stories that you like so much that you just have to tell them. Those are the stories you should tell.

Beware of "fakelore" stories. Unfortunately, there is a downside to using stories in science class. Some of the stories that people tell about the world may appear to be "science stories" but are instead a form of folklore or "urban legend" that sounds real but is really made up. While there are good reasons to use folktales as an educational tool, you should be clear with your students when you are telling them folklore and when you are telling them a science story. Several fakelore "science stories" circulate on the internet. One is about parachuting cats into Borneo to treat a rat outbreak. Usually these stories have no references. You can ferret out some of these fakelore stories at www.snopes.com. Make sure any "science stories" you tell have a factual basis from reputable books or internet sites like www.sciencenews.org.

Learning a Story

There are many ways to learn and tell a story, but I have found that the steps below work well for both beginning and experienced storytellers.

1. Begin with a short tale that you love.

It is difficult to tell any story that doesn't appeal to you.

To tell a story well, you need to be invested in the story. The story should connect with you on an emotional level. That way, you will spend the time to craft the story and to tell it well. If you feel that you "have to" tell a story, whether you like it or not, it will probably come out with as much energy as the Shakespeare poem that you had to memorize and perform in 6th grade. While it is possible to tell a story that you don't like, I wouldn't recommend it, for you or your listeners. Storytelling needs to be an avocation, something you like to do, or it will be very difficult to do it well.

Especially when you are starting out in storytelling, choose stories that are only 1-3 pages long and can be told in 3-5 minutes. After you have learned a few shorter tales then you are ready to move on to longer stories.

2. Read the story four times.

Read it once to make sure that you like it. Read it again for the plot line. Read it a third time for the characters, and read it once more to put it all together. Then put the book away for a while. After reading a story four times, the story should be stuck in your brain.

3. Make a story outline.

Think of the story as if it were a series of pictures in your head (not just words on a page). While some storytellers do well writing out a text outline of the story, I prefer to use a "Story Scene Outline."

The Story Scene Outline

Draw four boxes on a piece of paper. Draw a picture of the opening scene of the story in the first box. Draw a picture of the closing scene of the story in the last box. Then draw pictures in the second and third boxes to get listeners from the beginning to the end of the story. Now you have four pictures that carry you from the beginning to the end of the story. It is these images that you will be remembering when you tell the story. When telling your story, move from describing one picture to describing the next picture, fleshing out the story as you go. By connecting these picture events in a narrative, you will complete the story.

Think about a story as something that you tell “scene by scene,” and not “word by word.” The idea is that tellers should not try to memorize the text of a story. They often use the words from a text, or words that they hear from another storyteller, to create story images in their heads. Then when they retell a story, they simply describe those images to the audience.

As you become more familiar with the story scene outline, making story pictures in your head will become second nature. Soon you won't even need to write it down, you will just automatically make it in your head.

4. Practice, practice, practice

Tell your story into a tape recorder, in front of a mirror, in the shower, in the car and with your friends and family. You will notice that the more often you tell a particular story, the more it grows and changes into your own unique version of that tale. The more a story grows, the better it gets and the easier it will be for you to tell.

5. Tell the story to another person.

You can read about storytelling and practice storytelling all that you want, but until you tell a story to another person, you aren't a storyteller. This is one of the scariest parts of the process, but it is also the most rewarding. If you are a teacher, librarian or naturalist, then your job gives you a built-in audience. If you don't have an audience already, volunteer to tell stories at a school or library so you can “get your feet wet” in the world of storytelling.

Teachers are used to standing in front of a class and talking, but telling a story can still be scary. It may be outside your “comfort zone.” All you have to remember is to pick where you want to stand. Take a deep breath, look at your audience and start telling the story. Don't stop until you are done.

I like to remember that I'm not the one people are there to see and to hear. I am just an instrument telling a story. It is the story that people want to hear. That idea makes me less nervous and reminds me of my real role in the act of storytelling.

6. Connect the story to your lesson.

Some teachers make the mistake of telling students that folktales are just stories that people told “before we knew better” and had science to explain things. But that misses the point of using stories as a teaching tool. When I finish a folktale story, I might say, “This story gave us a story reason for why birds are different colors. Can anyone think of a science reason for why birds are different colors?” That way I can connect an enjoyable animal story to the biology lesson at hand and I know that the story has prepared students to learn more science.

WHEN TO USE STORIES IN EDUCATION

While educators could present an entire educational program using environmental stories, most likely you will use individual stories to make a point in an education lesson that may also contain lecture, hands on activities, outdoor explorations, etc. There are three points in any educational lesson where a teacher could use a story: opening, transitions and closing.

Opener—Use a story to lead off a lesson. When I am teaching a lesson on Forest Diversity, I might start with a diversity-themed story like "Dutch Nightmare on Elm Street." Then I would return to the story at the end of the class and ask students what that story had to do with the lesson they just completed.

Closer—Use a story at the end of a lesson as the “Pow!” that will inspire students to take a lesson to heart. Stories like “Hearing What’s Important” are good for these situations.

Transition Times and Rest Times— Outdoor environmental education programs often involve hiking. Rest times on a hike or transition times between topics in the classroom can be great times to introduce a story. Stories used at these times can get students to think about a topic in a new way and can help students give their “logical/mathematical” brains a rest while they use their “auditory” and creative intelligences. Short tales like Aesop's Fables can fit well as transitions.

SCIENCE STORY EXAMPLES

(For more stories, check out the Environmental Storytelling Database at www.naturestory.com)

Anecdotes, Fables and Jokes

Sweeping the Ocean (Fable or Urban Legend)

There once was a young researcher studying oceanography. He ran into his professor’s office excited with his most recent discovery.

“I just discovered that the smallest fish in our harbor is two inches long!” he reported.

The professor asked to see the student’s research boat. He smiled when he noticed that the student had used regular fishing net with a two-inch mesh.

(I heard this fable in college. While it is almost certainly a fable or “urban legend,” the message is still important for scientists and science students.)

Hearing what’s important (Anecdote)

Two men were walking down the sidewalk on a noisy, big city street when one stopped and said, “Wait, I hear a cricket.”

“No you don’t,” said the second man. “Were in the middle of the city. There’re aren’t crickets here.”

The first man walked to a cement planter and looked under a flower leaf to find the singing cricket.

“How did you hear that?”

“It all depends on what you’re listening for,” said the second man. “Watch.”

He took a handful of change and threw it on the sidewalk. All of a sudden, everyone on the sidewalk stopped and began looking for the coins.

“It all depends on what you’re listening for.”

(You can find another version of this story in Ed Brody, et al., eds., *Spinning Tales, Weaving Hope: Stories, Storytelling and Activities for Peace, Justice and the Environment* (Gabriola Island, BC: New Society Publishers, 2002), 281pp. \$24.95pa. ISBN 0-86571-447-9pa.)

Alice Algae and Freddy Fungus (United States)

Long ago there was a fungus named Freddy. Now Freddy Fungus was very good at building houses, but he wasn’t a very good cook. In fact, he couldn’t even make his own food; like all funguses, he had to find dead plants or animals to eat, and sometimes he couldn’t find much food. One day, while Freddy Fungus was sitting on a tree stump, he looked over at a rain puddle and saw something green growing there. The green thing looked up at him and smiled.

“What’s your name,” the green thing said.

“I’m Freddy Fungus. What’s your name?”

“I’m Alice Algae and I was just making some food out of sunshine. Are you hungry?”

Freddy Fungus blew right over there, and people say that Freddy Fungus and Alice Algae took a lichen (liking) to each other. They decided to get married. And from then on, Freddy Fungus would make a

house and Alice Algae would make food and they could live wherever they wanted, as long as there was sunlight.

That's why to this day, when we see a lichen plant, we tell the symbiotic story of a fungus and an alga that fell in love. Keep that in mind the next time you see lichen on a rock.

(I have heard this story told as "Fran Fungus" and "Andy Algae." That way the story isn't reinforcing human gender stereotypes. It really doesn't matter to the fungi and algae. They don't have gender.)

Real Life Stories

The Rise of the Plants (Natural History)

Long ago in the northland, after the mountains of ice had scraped the land down to rock, the Rock people looked around at the world. Nothing moved, and they liked it that way. But as time went by, tiny creatures came blowing on the wind. They landed like dust on the rocks and grew very slowly. They were flat and gray and they spread over the face of the rocks. They whispered "grow, grow" day and night. They weren't much faster than the rocks, but slowly the Lichen people grew across the rocky land. They didn't need soil to grow, all they needed was sun and rain, and the land had plenty of that. As the Lichen people grew, they broke up bits of rock with their fingers. When they died, they made a bit of dirt. Some of that soil fell into cracks in the rock.

After a while, more creatures arrived. The next ones were taller than the Lichen people. They were tall and green. They were faster than the Lichens and they grew across the new soil like a slow green wave. They were the Moss people. The Moss people chanted "grow faster, grow faster" as they stretched an inch into the air. As the Moss people grew, they shaded out the Lichens so the Lichens moved on to other sunny rocks. When the Moss people died, they turned into even more soil.

Soon seeds blew in on the wind and landed on that soil. The first seeds came from the Grass people. The Grass people chanted "grow fast day and night, grow fast to reach the light," and that is just what they did. They grew tall, for this world, and shaded out the Mosses. The Mosses moved on to shadier rocks. When the Grasses died, the soil from their bodies covered the rocks. Next came the trees, at first scrubby pines and oaks, but later the big maples.

Now people come to the North Country to visit the lakes and fish for walleyes and camp under the white pines. But most people don't realize that long ago, there was nothing here but rock, and it was the tiny plants—the lichen, the moss, and the grass—that made the land green and made it grow such a long, long time ago.

(This story shows how to turn natural science into stories by choosing story characters from the natural world and telling the story from their perspective. The story describes the plant colonization of glaciated parts of North America. But similar plant succession happens on mountaintops and rocky regions cleared by intense fires. Adapt the story to your own region.)

Dutch Nightmare on Elm Street (Natural History)

It is hard to know how things travel sometimes, but it is clear that they do. In the 1950s, towns and forest in the Midwest were covered with the graceful arching branches of elm trees (*Ulmus americanus*). The elms grew so thick along the main street of my hometown that their branches interlaced over the street, making a tunnel of green leaves and shade on the hot summer days.

But then it happened. One day, a man walking down the street noticed that leaves on one tree were turning yellow in July, long before they should. Then more trees began changing color. The city forester looked closer at the trees and noticed tiny holes in the bark. Soon the yellow leaves were dropping from the elm tree branches. The forester took wood samples and sent them to a lab.

The forester began cutting down the sick trees, hoping that would stop the problem. The lab scientists found that a fungus had infected the elm trees. They called it "Dutch elm disease." The fungus came from Europe, probably on tree trunks or the backs of bark beetles. This fungus ate trees from the inside out. Bark

beetles carried the fungus from elm tree to elm tree. Soon most of the elms in the town had turned yellow. Sunlight streamed down onto the streets. Urban forests of elm trees became a graveyard of dead trunks.

Now nature has its cycles. The elms were gone. But after the city forester cut down and burned the dead trees, he planted new trees in their place. But he didn't plant elms. He planted sugar maples and oaks and ash trees and spruce. Today, some of these trees are very large. They don't reach their branches over the street to make a shady tunnel in the summer, but they give us a bit of shade. When we asked the forester why he planted so many different kinds of trees in town, he looked at us and said, "diversity is the key to stability," and went on with his work. Never again has a disease stripped our town of its trees.

(Source: Several books and websites describe Dutch elm disease and its effects on cities. One source is from the University of Minnesota Extension Service

<http://www.extension.umn.edu/distribution/naturalresources/components/3765a.html>)

Folktales

Wolf and Dog (Aesop)

Long ago, Wolf was hungry. Wolf was so hungry, that he decided to look for food near where the humans lived.

It was dangerous to hunt near humans. Some wolves that go there never come back. But Wolf had never been this hungry before. So as the sun dipped red behind the western hills, he walked through the forest to the edge of a farmer's field.

Wolf sniffed the air and scanned the field; it was then that he heard a strange sound. The barking noise was coming from a creature that looked a lot like he did, and the creature was running right at Wolf.

"Woof!" said the creature.

"Cousin, why are you speaking so strangely? We wolves never bark like that," said Wolf.

"I'm not your cousin. I am a dog and we bark when we see wild animals near the farm," said Dog.

"Well we certainly do look alike, perhaps we are related in some way," said Wolf. And then he noticed how fat Dog was.

"Say cousin, how is it that I am starving while you seem to have plenty of food?" said Wolf.

"I work for my meals. I chase wild animals and robbers away from the farm, and for that work I am well paid. Every evening, my master scrapes his table scraps into a bowl and feeds me until I am full," said Dog.

"You mean you don't have to hunt for your food and catch it in the forest?" said Wolf.

"Of course not, why would I do that. The only hunting I do is for fun," said Dog.

"Say cousin, do you think that your master could use another worker?" said Wolf.

"Well, I guess so. There is always work to do. Let's go ask my master," said Dog.

Wolf and Dog walked up to the farmhouse. As they got closer to the house, Wolf noticed that Dog had no fur around his neck.

"Dog, why do you have no fur on your neck," said Wolf.

"Well it's nothing, really. My master doesn't want me running off during the day, so he ties me up near the house, and when I pull at the rope, it wears away the fur on my neck. It's fine though; all I do is sleep through the day. You'll get used to it," said Dog.

Wolf stopped. He looked at the forest, then back at Dog and then back at the forest.

"No Dog, I don't think I can get used to that."

And wolf turned and ran back to the darkness of the woods. People say that from that time on, wolves have lived in the forest, and dogs have lived with people.

(This story is a folktale example of "behavioral adaptations" for both wolves and domestic dogs. Scientists believe that about 12,000 years ago, humans captured and began domesticating wolves. We selectively bred dogs to follow our commands and help with our work. Over thousands of years, we produced every breed of dog from the toy poodle to the Great Dane, all descendants of the wolf.)

Deer's Antlers (Aesop)

One day a Deer was walking through the forest. But every few steps, he would sniff the air to make sure that he was safe. You see the world is a dangerous place for deer. They fear wolves and dogs and hunters most of all. But this time, Deer didn't smell any of those things, so he walked to a pond to get a drink. The morning air was still and the pond was smooth like a mirror. As Deer gazed at his reflection, he thought to himself.

"Look at my beautiful antlers! I should be king of all the forest creatures, for no animal has a crown as wonderful as mine."

But then Deer's gaze fell to his legs, his skinny, bony deer legs.

"That is why I am not king. You can't be a king if you have spindly, skinny legs like these!"

Just then Deer heard a twig snap. He looked up to see a hunter with his bow drawn. Deer turned and ran into the woods. The arrow flew right past Deer's head and sank into a tree trunk. Deer zigzagged through the trees. But he could hear the hunter and the hunter's dog right behind. Deer came to a huge oak tree and tried to duck under its branches but, plunk, his antlers got stuck in the twigs. Deer pushed forward and he pushed to the right and his pushed to the left, but he couldn't get loose. He could hear the hunter and he dog closing in. Finally, with one last yank, he pulled back and with a snap, his antlers broke through the twigs. Deer ran around the oak tree and out into a meadow. He leapt and he leapt on those long deer legs until that hunter and his dog were just a bad, bad memory.

A few days later, Deer was walking in that same part of the forest. Once again, he sniffed the air to make sure there wasn't any danger. Then he walked to that pond for a drink. But before he drank he looked at his reflection in the water and said, "Look at my beautiful legs."

(This story can be a good introduction to talking about animal adaptations. Both deer antlers and a deer's long legs are adaptations that help deer survive.)

Environmental Storytelling Resources:

Strauss, Kevin. **Tales with Tails: storytelling the wonders of the natural world.** (Westport, CT: Libraries Unlimited, 2006). 230pp. \$35.00pa. ISBN 1-59158-269-5pa.

This book is the "textbook for environmental storytelling," including more information on learning and telling stories, biology and ecology information and over 60 environmental stories. You can order this book at www.naturestory.com/products.

Strauss, Kevin. **The Song of the Wolf.** (Wever, IA: Quixote Press, 2005). 182pp. \$9.95pa. ISBN 1-57166-273-1pa.

Contains 16 wolf folktales that show wolf characters who are helpful, foolish, wise and mean. Also contains a section on wolf biology and ecology. You can order this book at www.naturestory.com/products.

Education Resources:

Brand, Susan Trostle and Jeanne M. Donato. **Storytelling in Emergent Literacy: Fostering Multiple Intelligences.** Albany, NY: Delmar, 2001. 354p. \$33.95pa. ISBN 0-7668-1480-7pa.

Haven, Kendall. **Super Simple Storytelling.** Englewood, CO: Teacher Idea Press, 2000. 229p. \$25.00pa. \$25.00. ISBN 1-56308-681-6pa.

Weaver, Mary, ed. **Tales as Tools.** Jonesborough, TN: National Storytelling Press, 1994. 213p. \$19.95pa. ISBN 1-879991-15-2pa.