TINKER THE T-REX

EDUCATOR RESOURCE GUIDE

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DISCOVERY Center of Idaho

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TINKER THE T-REX

Educator Resource Guide

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How to Use the Educator Resource Guide

We hope the resource guide provides ideas on how to design a meaningful, informative, and fun visit to the Discovery Center. This resource guide will help orient you to the exhibit signage and layout and how it might be used as a tool during your visit. Copies of exhibit signage are included to help provide background information on the main concepts covered at each of the interactives. There is a list of potential connections between the exhibits and the Idaho Science Content Standard to help draw connections between the Center and your classroom. We have included a field work planning guide with examples, to help you set goals and prepare your students for their visit to the Center.

Science Content Standard Connections

The Idaho Science Content Standards identified below are an overview of some of the science standards addressed through our Tinker the T-Rex! exhibits. Please remember, this is just a place to start! There are many additional connections, including those across disciplines and among many fields of science that can be addressed during a visit to the Center.

Kindergarten: PS1-K

First Grade: PS-1-1

Second Grade: ES1-2-1, ESS2-2-1

Third Grade: PS1-3-1

Fourth Grade: PS1-4-1, PS1-4-3, PS1-4-4, ES3-4-2, ESS3-4-1

Middle School (6th-8th): PS2-MS-1, PS2-MS-1

Engineering Design (Next Generation Science Standards): K-2-ETS1, 3-5-ETS1, MS-ETS1

Tinker the T-Rex! Overview

TINKER THE T-REX

TINKER THE T-REX is a new exhibit designed by the Discovery Center and dedicated to explorations of STEM and paleontology.

Discover the story behind Tinker, a *Tyrannosaurus rex* skeleton discovered in South Dakota. Tinker is the most complete fossilized skeleton of a juvenile *T. rex* ever found. Each exhibit provides tools for discovery to bring this dinosaur's world to life.

Visitors of all ages can:

- Learn about the life of a young *T. rex.*
- Compare their strength to a *T. rex*.
- Animate *T. rex* movement.
- Take a closer look at ancient fossils.
- Learn about Earth during the Cretaceous Period.

As you explore, try out these steps to make the most of your visit. Remember to ask our educators for ideas or assistance!

Imagine

Imagine the world during the late Cretaceous, when Tinker and other giant dinosaurs roamed North America. How was their world different than ours?

Experiment

Try the experiments at each hands-on exhibit. How do scientists learn about and reconstruct the past?

Discover

What will you discover about Tinker and other dinosaurs? What don't we know yet, and how will we learn more?

Learning from Tinker

Tinker is the fossilized skeleton of a Tyrannosaurus rex that was discovered in South Dakota in 1998. In human years, Tinker could well have been a teenager. This juvenile T. rex was about two-thirds of adult size and only one-fourth adult weight.

Tinker died over 66 million years ago during the late Cretaceous Period. Her fossilized bones were found with those of her mother, as well as those of a duck-bill dinosaur that may have been their prey. This skeleton of Tinker is a cast of the original fossils.

Scientists are studying Tinker to learn about the life of a young Tyrannosaurus rex. Her fossilized skeleton shows evidence of injury—broken bones that healed over time. It is possible that Tinker was already an aggressive animal when she died, attacking prey her size or larger.

Tinker has the same number of teeth as an adult T. rex. This means she ate similar food. Scientists do not know if Tinker was hunting on her own yet or still being fed by her mother. Either way, she needed a lot of food to stay active and strong. Scientists now think that Tyrannosaurus rex hunted in teams and scavenged for dead animals. This power predator could eat up to 500 pounds in one mouthful—about half the weight of an adult horse!

What did Tinker Look Like?

TINKER THE T-REX

Each time scientists discover a T. rex skeleton, they can better reconstruct what the animal looked like. No real dinosaur skin remains, but fossil impressions reveal a pebbly or scaly texture. Some dinosaurs, including close relatives of T. rex show evidence of fossilized feathers. Today, many scientists wonder if T. rex sported fine, wispy feathers—a little like a bird's.

Scientists are also examining the soft tissue cells in fossils for skin color clues. Shades of brown or green could have helped T.rex blend into their environment. However, the rich and varied colors of birds could have helped them recognize each other and attract mates. Was Tinker's skin purple, orange, red, or spotted pink and blue? No one knows for sure.

TINKER STATS:

Species:
Tyrannosaurus rex
(ty-RAN-oh-SORE-us-REX)

Subgroup:
Therapod dinosaur

Height: 10 feet, 2 inches

Length: 30 feet
Weight: ¼ adult weight, possibly 3,850 pounds

Skull: Assembled from 300 pieces

TINKER THE T-REX

The Age of Dinosaurs

Geologists divide the history of the Earth into long chunks of time called eras. Each era is marked by changes in the fossils found in rock layers. The Mesozoic Era is known as Age of the Dinosaurs. Within this era, shorter periods marked by different kinds of dinosaurs and other prehistoric animals.

Tinker and other Tyrannosaurs thrived in the Late Cretaceous Period, just before the dinosaurs went extinct. The climate then was very hot and wet. Jungles and flowering plants covered much of North America.

Fossils & Fossil Fuels

Most prehistoric plants and animals decayed when they died. However, if the conditions were just right, their remains formed a fossil over millions of years.

1. An animal was buried by mud or sand. The soft parts of the animal rotted away, leaving behind a skeleton
2. The skeleton dissolved. Groundwater dissolved the skeleton to leave a hole, or natural mold, in the exact shape of the bones.
3. Minerals crystallized inside the mold. Over time, the mud and sand layers hardened into stone. Mineral-rich water filled the mold and crystals grew
4. The fossil was exposed on the Earth's surface. After millions of years, the rock rose to the Earth's surface. Wind and rain eroded rock to expose the fossil

Coal, oil and natural gas also come from the remains of ancient plants and animals, but in a different way.

1. The remains of ancient organisms sunk to the bottom of an ocean or swamp. Oil and natural gas come from sea creatures such as prehistoric plankton. Coal comes from dead plants that sank to the bottom of a swamp.
2. Layers of mud and sand buried the organic (once living) material. The cellular material gradually decayed, but carbon was left behind.
3. Over millions of years, heat and pressure converted the material into oil, gas, or coal.
4. We drill or mine deep into rock to extract fossil fuels. We burn fossil fuels for energy to heat our homes, power our cars, and much more.

DID YOU KNOW?

Another kind of fossil formed when sticky tree sap covered an insect or plant leaf. Over millions of years, the sap hardened into amber.

How to Use the Exhibit Signage as a Tool

The top banner of the exhibit sign includes the Exhibit Name (1) and Content Area (2). The key content areas, and specific topics you may see covered at an exhibit, are represented in the table below. The clearly denoted content areas are intended to give greater clarity to which concepts are covered at each exhibit and how the exhibit can connect to Idaho Science Standards.

The Test & Observe (3) section includes a list of questions to help guide and facilitate deeper learning and engagement at each of the exhibits. This section is modeled after Kolb's Experiential Learning Theory (1984) which uses open-ended questions to prompt students to observe, reflect, build understanding, and test their ideas through further experimentation and conceptualization.

1. Exhibit Name
2. Content Area
3. Test & Observe
4. What's Happening?
5. Fun Facts

Kolb, David A. (1984). Experiential learning: experience as the source of learning and development. Englewood Cliffs, NJ: Prentice-Hall.

Copies of Exhibit Signage

As you review the exhibit signage, consider, what additional experiments, writing prompts, or classroom learning moments could support these concepts before or after your visit to the Center?

TAIL BALANCE

Content Area: Forces & Motion

TEST & OBSERVE

- What happens to T. rex's head when you move its tail from side to side?
- What happens to its tail if T. rex bent down to sniff something on the ground?
- Can you make the tail into an S or C-curve? Does T. rex's balance change?

WHAT'S HAPPENING?

T. rex's long, pointed tail helped counterbalance its massive head. This dinosaur's body pivoted at the hip, much like the middle of a giant seesaw. T. rex's tail also helped it balance swift turns, which was important for a meat-eater tracking prey.

FUN FACTS

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TAKE A CLOSER LOOK: FOSSILS

Content Area: Earth Science

TEST & OBSERVE

- Which fossil is your favorite and why?
- Can you find evidence of crystals in the fossils?
- Try rotating the slide carousel to view different parts of the same fossil. What do you notice?

WHAT'S HAPPENING?

Although fossils don't contain any living material, they can be quite detailed. The imprint of fine feathers can be seen in some prehistoric bird fossils. Skin patterns have also been found in dinosaur fossils. Using a magnifying glass or microscope can reval even more detail.

FUN FACTS

Not all fossils are animal skeletons. Sometimes dinosaurs stepped in muddy areas, and sand filled the tracks before they washed away. Over time the sand hardened to form the fossil of a footprint, called a trace fossil. This kind of fossil helps scientists learn about dinosaur behavior such as walking speed.

BITE STRENGTH

Content Area: Earth Science

TEST & OBSERVE

- Do you get different results when you squeeze from the top of the rods?
- Try squeezing with your palms against the rods, then again with your fingertips. How does your strength compare?

WHAT'S HAPPENING?

The metal rods measure your grip strength in pounds of pressure.
T. rex's front claws were not very powerful, but its jaws were
lined with sharp teeth that could easily crush the bones of other
dinosaurs. This predator could bite down with about 10,000
pounds of pressure—the strongest of any land animal ever to live!

FUN FACTS

An adult T. rex had 60
saw-edged, or serrated,
teeth. T. rex grew new teeth
to replace lost or broken ones.

How does T. Rex's bite compare?

T. rex: 10,000 lbs. of pressure
Great white shark: 4,000 lbs.
Alligator: 2,500 lbs.
Lion: 1,000 lbs.
German shepherd: 238 lbs.
Human: 200 lbs.
Piranha: 70 lbs.

MIGHTY MOVER

Content Area: Earth Science

TEST & OBSERVE

- What do you notice about T. rex's motion when you slow down its walk?
- How do you think the dinosaur used its short front claws/arms?
- Can you make T. rex walk or run backwards?

WHAT'S HAPPENING?

This animation shows what T. rex may have looked like while hunting. The giant predator walked on huge back legs supported by strong thigh muscles. Its eyes faced forward, which gave it good depth perception for hunting. T. rex may have attacked herds of plant-eating dinosaurs with its powerful jaws wide open.

FUN FACTS

Because of its size, T. rex probably did not run very fast. Adults grew as large as 15,400 pounds! Running faster than 20 miles per hour would have shattered T. rex's bones.

How does T-Rex's speed compare?

Cheetah, 75 mph
Antelope, 55 mph
Hare, 50 mph
Coyote, 40 mph
Human, 30 mph
T. rex, 20 mph
Elephant, 15.5 mph

TINKER THE T-REX

Discovery Center of Idaho Field Work Planning Guide

From "Field Trip" to "Field Work": Reimagining the Student Experience

Just like scientists, students benefit from spending time in the field making observations, inspiring curiosity, and researching a concept. This planning guide can help identify your goals for your students' field work at the Center and help your students meet those goals.

STEP ONE: IMAGINE THE POSSIBILITIES

In the boxes below, please describe the learning experience you have imagined for your students. What field work will your students do while they are at the Center? What will your students do before and after your field work to connect learning to your classroom?

BEFORE	DURING	AFTER

Discovery Center of Idaho Field Work Planning Guide *(continued)*

STEP TWO: DEFINE YOUR GOALS

What do you hope students will be curious about when they visit the Center?
What do you hope students will take away from this experience?

BEFORE	DURING	AFTER

STEP THREE: COLLABORATION

Please contact Discovery Center education staff at education@dcidaho.org with any remaining questions or concerns you have about your upcoming field work. We're here to help!

TINKER THE T-REX

Field Work Planning Guide example

Education at Discovery Center of Idaho Information

The Discovery Center of Idaho's mission is to inspire lifelong interest and learning in Science, Technology, Engineering, and Math.

The Education Department at the Discovery Center of Idaho seeks to provide quality educational experiences & programs that reflect excellence in their development, mastery in their delivery, and offer relevant and sustainable interactions that inspire lifelong interest and learning in S.T.E.M. for a diverse, local, regional, and statewide, DCI community.

Contact

If you have any questions or need help in anyway while planning your class trip to the Discovery Center of Idaho, please reach out to education@dcidaho.org.

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