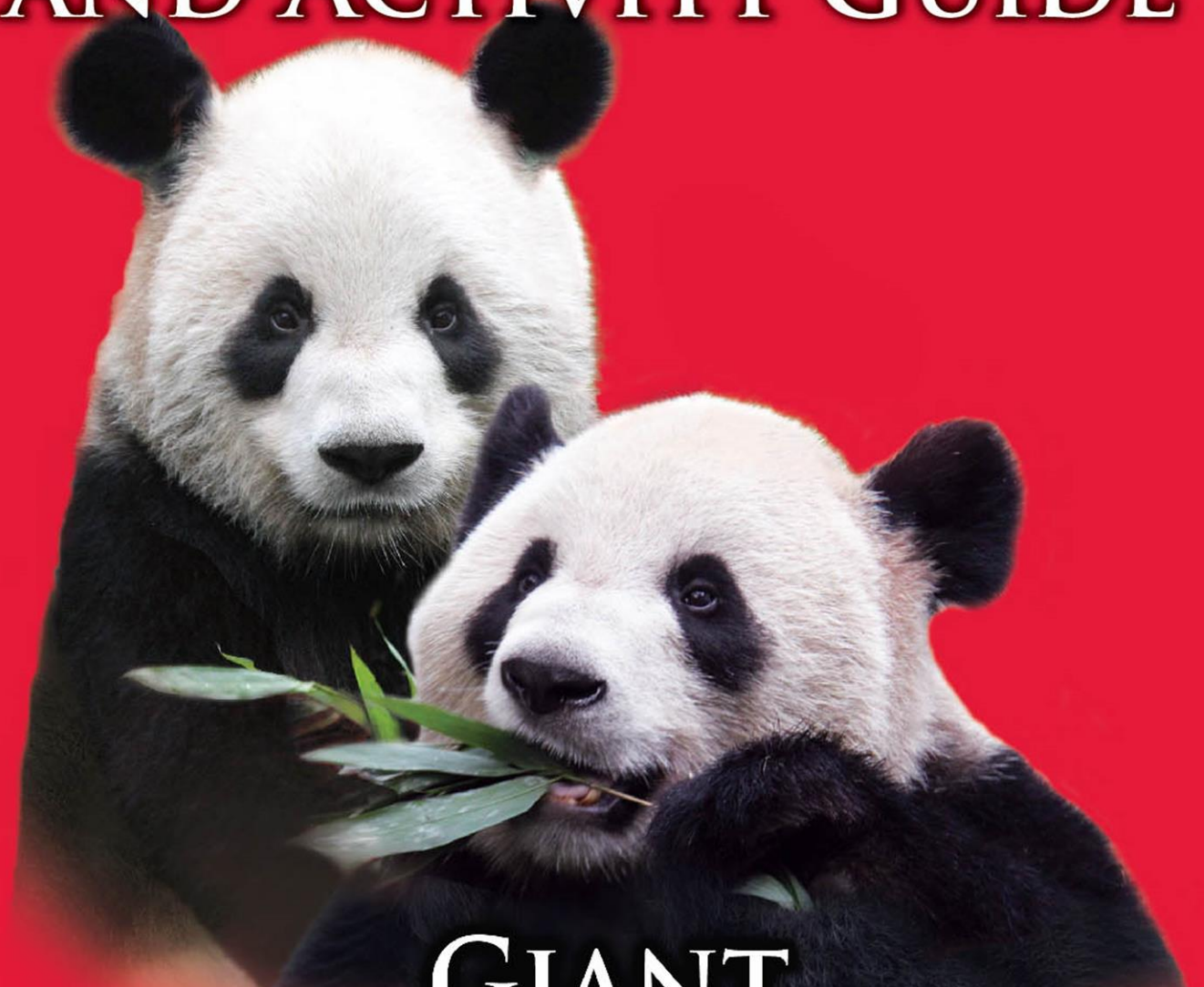# toronto ZOO
Same planet. Different world.

Teacher Resources and Activity Guide

Giant PANDAS Are Here!

torontozoo.com

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Toronto Zoo Welcomes Giant Pandas!

What's white and black and returning to the Toronto Zoo?
You guessed it...the giant panda!

In May 2013, two giant pandas, *Er Shun* and *Da Mao*, were welcomed to the Toronto Zoo, 27 years after pandas first visited. This represented the culmination of over ten years of dedication by several Zoo staff and Board members, who shared the vision of a giant panda conservation program here at the Toronto Zoo. On February 11, 2012, John Tracogna, CEO of the Toronto Zoo, Dr. Clement Lanthier, President and CEO of the Calgary Zoo, and Ms. Hu Zhongping, Vice-President and Secretary-General of the Chinese Association of Zoological Gardens, signed the Giant Panda Cooperation agreement at an official ceremony in Chongqing, China, with Canadian Prime Minister Stephen Harper in attendance.

Er Shun and *Da Mao* will remain at the Toronto Zoo for a minimum of five years before relocating to the Calgary Zoo in 2018 for another five years. The primary goal of the giant panda initiative is to develop a co-operative breeding program between China, Toronto Zoo, and Calgary Zoo, focusing on conservation, education, scientific research, and husbandry.

While in Toronto, the giant pandas will call the former Amur tiger exhibit home. This exhibit has been renovated specifically for the pandas and includes expanded exhibit area, a pool, cave, misters, and climbing structures. When the giant pandas depart for Calgary, Amur tigers will return to their upgraded exhibit.

The Toronto Zoo is excited and honoured to join a small group of highly respected zoo organizations outside China that are involved with the conservation of this iconic, endangered species. Join us in this momentous occasion and welcome our newest visitors, *Er Shun* and *Da Mao*, to the Toronto Zoo.

Meet Our Bears: *Er Shun and Da Mao*

Er Shun

Born: August 10, 2007
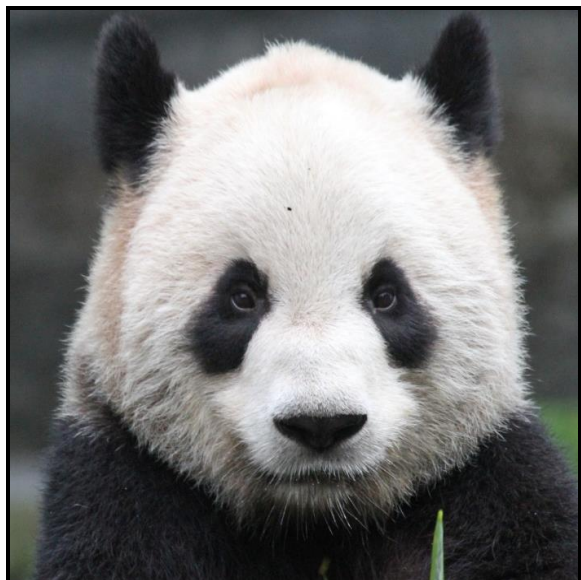
revealed that "he"

Er Shun is a six-year old female who was born at the Chongqing Zoo in Chongqing, China. She was raised by her mother Ya Ya. Er Shun's name me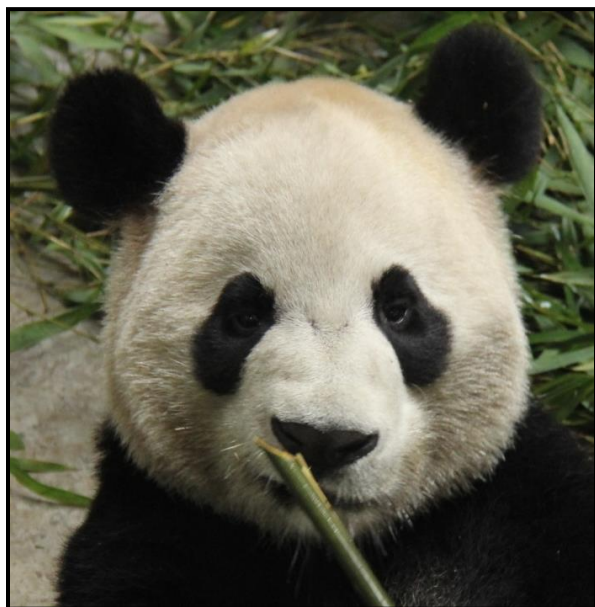ans 'double smoothness'. She was given this name because she is the second cub born to her mother and the keepers wanted her to have a smooth and happy life. During a physical examination in November 2012, it was discovered that *Er Shun* was keeping a GIANT secret. Originally thought to be a boy, genetic testing was really a "she"!

Da Mao

Born: September 1, 2008

Da Mao is a five-year old male who was born at the Chengdu Panda Breeding and Research Centre, which is located in the Sichuan Province of China. *Da Mao* was conceived through artificial insemination and was hand-reared by staff at the breeding centre. He was the first cub for his mother Mao Mao, so his name means "first of Mao". *Da Mao* was chosen to replace the original female, *Ji Li*, after it was revealed that *Er Shun* was actually a female and is considered a good genetic match to *Er Shun*.

Bamboo Challenges…

The nutrition of giant pandas is unique and is a great example of nutritional specialization, as bamboo makes up 99% of their diet. Due to their inefficient digestion, giant pandas need to consume comparatively large amounts of food in order to receive enough nutrients. Giant pandas, therefore, must spend up to 16 hours a day foraging and eating bamboo. While usually eating about 20 kilograms (44 pounds) of bamboo daily, it is possible for giant pandas to eat almost twice that much (38 kilograms or 84 pounds) in a single day. At the Toronto Zoo, nutritionists and wildlife care staff offer over 100 kg of bamboo to *Er Shun* and *Da Mao* every day!

Although giant pandas can consume more than 25 species of bamboo, they depend on four or five species that grow in their home range. Obtaining bamboo for pandas in captivity can be quite challenging, especially if it is in a climate where only a few species grow successfully (like Canada!). The bamboo for *Er Shun* and *Da Mao* is harvested at plantations owned by the Memphis Zoo in Tennessee, United States. Two to three times a week, 600 to 900 kg of freshly cut bundles of bamboo, each packed and sealed in plastic sleeves (to avoid moisture loss) and kept at low temperature, is shipped to the giant panda "Bamboo Cooler" at the Toronto Zoo. Meeting the nutritional needs of the giant pandas is a GIANT project and requires the daily coordination between wildlife care staff, nutritionists, and the bamboo harvesters in Memphis to determine which bamboo species to supply and how much is needed.

In addition to the large quantities of bamboo, *Er Shun* and *Da Mao* are also offered leaf eater biscuits with added vitamins and minerals, and some fruits, including apples.

Spotted: Er Shun eating bamboo.

Planning a Toronto Zoo Fieldtrip

To Book a Self-Guided School Visit:
- Please call Group Bookings at 416-392-5932 at least two weeks in advance of the trip

Interested in a curriculum-linked school program, including our new Panda Programs:
- Please call 416-392-5944 or email schools@torontozoo.ca for more information

Zoo Hours*:
- *Jan. 1 – Mar. 8:*   9:30 am – 4:30 pm daily**
- *Mar. 9 – Mar. 17:*   9:30 am – 6:00 pm daily
- *Mar. 18 – Apr. 30:*   9:30 am – 4:30 am weekdays
                           9:30 am – 6:00 pm weekends/holiday
- *May 1 – Sept. 2:*   9:00 am – 7:00 pm daily
- *Sept. 3 – Oct. 31:*   9:00 am – 6:00 pm daily
- *Nov. 1 – Dec. 31:*   9:30 am – 4:30 pm daily

        * subject to change without notice   *** last admission 1 hour before closing*

School Group Admission Rates (includes HST):
- $8 per student/supervisor (elementary)
- 1 teacher free per class

Supervisor to Student Ratio:
- *Grades K – 3:*   **1** supervisor per **5** students
- *Grades 4 – 8:*   **1** supervisor per **10** students

Winter Time Fieldtrip:
Thinking of coming with your class, but worried about the weather? The Zoo offers many indoor spaces that offer protection from the elements, while boasting fabulous plants and animals for you and your class to learn about. This is also a great time to see giant pandas, polar bears, snow leopards, and many more in their snowy element!

Reminders:
- Payment can be made at Guest Services (located on the left side of the main entrance) by credit (American Express, MasterCard or VISA), cheque (payable to "Toronto Zoo"), or cash. Please ensure you have your *group confirmation* to expedite the payment process.

- The Zoo can be a busy place. Supervisors should know the names of every student in their group and should have the contact number for the supervising teacher in case of problems.

- The Toronto Zoo, including the Giant Panda Exhibit, is wheelchair accessible. For more information please visit:

  http://www.torontozoo.com/ExploretheZoo/Accessibility.asp
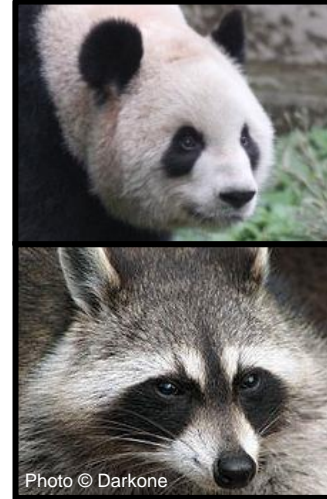
All About The Pandas: *Giant Panda*

*Known around the world as a symbol of wildlife conservation, this elusive white and black, bamboo-eating bear creates **panda-monium** wherever it goes!*

Scientific Name
Ailuropoda melanoleuca (in the family *Ursidae*)

Appearance
Some scientists thought the giant panda might be a raccoon due to physical similarities, but genetic testing has determined that giant pandas are actually bears. They are a small- to medium-sized bear that are white with distinctive black markings; they possess black arms, legs, ears, nose and patches around their eyes. They are often seen sitting upright eating bamboo and have an enlarged pad overlying the wrist bones that acts like a sixth digit or a thumb, all of which give them a "human-like appearance."

Photo © Darkone

Sixth digit or thumb

http://library.thinkquest.org/27396/forepaw.htm

http://nationalzoo.si.edu/animals/giantpandas/pandafacts/
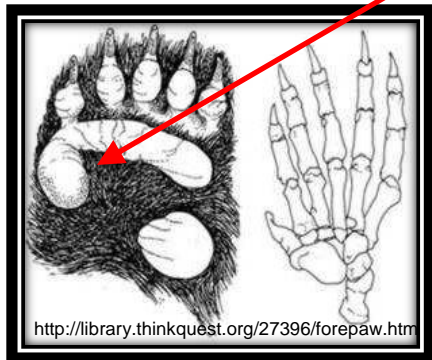
Size
- **Length:** 1.5 – 1.8 m
- **Height:** 60 – 90 cm (to shoulder)
- **Mass:** 80 – 125 kg (175 – 275 lb)

Range and Habitat
In the wild, giant pandas are only found in central China within the provinces of Sichuan, Gansu, and Shaanxi. Even in these select provinces, however, the giant panda population is not widespread, with

Russia

Mongolia

Gansu

Shaanxi

Sichuan

India

only 20 % of the total area (5,900 km^2 of 29,500 km^2) of the three provinces is suitable panda habitat. Giant pandas now live in six isolated mountain ranges and cannot travel from one area to another due to the presence of human settlements. This is leading to a decrease of biodiversity within the gene pool because the different panda groups cannot interbreed.

Giant pandas live in old-growth conifer forests that are found at high altitudes in the mountains. Dense stands of bamboo, which pandas rely heavily on, are found within these forests. The climate is temperate, meaning the summers and winters are fairly mild with no extreme weather. Pandas do not hibernate, but generally descend to lower elevations in the winter months, utilizing temporary shelters in crevices and caves. Unlike other bear species, they do not build permanent dens.

Diet

Bamboo accounts for an incredible 99 % of the pandas' diet. While it is present year-round as a food source, it is very low in nutritional value. To gain enough nutrition and energy from bamboo, pandas must eat a lot of it—up to 40 kg a day! They can spend over half the day eating bamboo stems, leaves, and shoots. In zoos, giant pandas eat bamboo (80 – 95 % of the diet) supplemented with apples, carrots, sweet potatoes, special biscuits, sugar cane, and sometimes rice gruel.

Even though pandas are herbivores by diet, they are, believe it or not, classified as carnivores (meat-eaters) and have the digestive system of a carnivore. Scientists have not been able to agree as to why this carnivorous animal evolved to eat primarily plants– and more specifically bamboo. Pandas are able to eat any of the 25 bamboo species found in the wild, however, only a few species are widespread at the altitudes that pandas now inhabit.

Reproduction

The mating season of the giant panda occurs from March to May. However, a mature female panda (at least six years of age) only ovulates once a year and is only able to conceive for one to three days within that period. Pandas can delay implantation for one and a half to four months, which allows offspring to be born at the most opportunistic time. Most young are born during the months of August and September.

Newborn panda cubs weigh 85 to 140 grams. That's lighter than an apple, about the size of a stick of butter, and 1/900 the size of its mother! They are blind, helpless, and covered with a thin layer of fur. Cubs will open their eyes at three weeks, but cannot move around on their own until three or four months of age. A cub will remain with its mother for up to a year and a half.

Photo © Colegota

Lifespan

The lifespan for giant pandas in the wild is ten to fifteen years of age. In captivity, however, pandas have been known to live, on average, for 26 to 30 years.

Behaviour

Giant pandas are a terrestrial mammal, but are capable of swimming and climbing. Most of their time is spent roaming and feeding in the bamboo forests. Individuals are generally solitary, occupying a defined territory, with females being intolerant of other females in their range. Pandas generally interact with each other only to mate and when there is a bond between mother and cub.

Major Threats

The largest threat facing giant pandas is habitat loss. Prime habitat has been lost or fragmented due to large areas of China's natural forests being cleared for agriculture, timber, and firewood in order to meet the needs of the growing human population. This has resulted in panda populations decreasing in size and becoming confined and isolated to high mountain ridges.

Their complete reliance on bamboo for food is also a major threat to the giant panda population. The natural life cycle of bamboo, is that it begins as a seed, growing into a seedling, then an adult plant, and finally to a flowering plant that releases seeds. After bamboo flowers, which happens every 30 to 80 years, the plant dies. The can become an issue if all the bamboo of a particularl species in an area flowers at the same time. If there is not another species of bamboo that the giant pandas will eat in their habitat, they are at risk of starvation. Further, it is possible that human encroachment may prevent pandas from being able to move to an area where a healthy bamboo forest is present.

Conservation

The giant panda is classified as **endangered** in the International Union for Conservation of Nature's Red List of Threatened Species. There are only an estimated 1,600 giant pandas left in the wild and about 300 in zoos and breeding reserves around the world. While many breeding programs have been developed, the slow reproduction rate of the panda (one cub every two years) has not resulted in a significant increase in numbers of giant pandas. The conservation of giant pandas is critical, as they play a crucial role in the bamboo forests by spreading seeds and facilitating the growth of vegetation.

Photo Credit: giantpandazoo.com

References:

http://nationalzoo.si.edu/Animals/GiantPandas/PandaFacts/default.cfm

http://animaldiversity.ummz.umich.edu/site/accounts/information/Ailuropoda_melanoleuca.html

http://eol.org/pages/328070/details

All About The Pandas: *Red Panda*

What's black, white, and red all over?
The cutest animal you will ever see: a red panda of course!

Scientific Name
Ailurus fulgens (in the family *Ailuridae*)

History
Red pandas were discovered in 1821, 50 years before the discovery of giant pandas. Just like the giant panda, red pandas were first described as resembling raccoons. However, scientifically classifying the red panda in its proper animal family has proven to be a daunting task. Several scientists and researchers have grouped them with the bear family, while others suggest they are more similar to and suited in the skunk and raccoon families. Specifically, there are many similarities seen between the reproduction of red pandas and that of skunks and raccoons. Although they do share many similarities with bears, raccoons, and other animals, scientists have placed red pandas into a family of their own.

Appearance
The red panda is often described as an attractive small-sized, animal, with a rather "foxy" face. Their triangular-shaped ears are covered with white fur, contrasted by their brilliantly-coloured rust-red torso and dark-coloured limbs. One of the most distinctive features of the red panda is its long, bushy, ochre-ringed tail.

Size
- **Head & Body Length:** 56 – 63 cm
- **Length of Tail:** 37 – 47 cm
- **Mass:** 3 – 6 kg (6.6 – 13.2 lb)

Range and Habitat
The range of the red panda extends from western Nepal to northern Myanmar, as well as throughout the mountainous areas of southwestern China (Yunnan, Sichuan and Xizang provinces) at elevations between 1,500 m and 3,960 m.

Red pandas live primarily in temperate forests in the hills surrounding the Himalayan Mountains. The temperature in this region is cool, with little annual variation. Bamboo grows in the understory of these forests, and supports the bulk of the red panda's diet. These stands of bamboo, however, are only found in narrow sections throughout the red panda's range. As a result, while red pandas are distributed across thousands of kilometers of territory, their reliance on bamboo restricts them to small, fragile areas.

Red pandas are often sighted in high ridges and low valleys in the temperate forests. When not eating bamboo, much of their time is spent high up in trees, sleeping or hunting birds and small mammals.

Diet

Similar to giant pandas, the red panda is commonly referred to as a vegetarian carnivore. The carnivorous-type digestive system is specialized for breaking down protein and fats (as found in meat) and not for digesting fibre and carbohydrates, which are the main nutrients of their bamboo-rich diet. The red panda has evolved to eat primarily bamboo and just like the giant panda, has a sixth digit or false thumb so that it can grasp the bamboo stems. Their sharp, curved and semi-retractable claws also assist in grasping onto narrow branches.

Red pandas eat only the youngest and most tender leaves and shoots of bamboo plants. They also eat fruits, eggs, blossoms, berries, and small mammals. In order to meet their nutritional needs, the red panda has to consume more than 1.5 kg of fresh bamboo leaves, or 4 kg of fresh shoots daily.

Reproduction

A six-year study on a captive population of red pandas revealed that they reach sexual maturity at around 18 to 20 months and usually have their first offspring at two years of age. They breed in late winter and give birth in early to mid-summer.

Studies have shown that they are induced ovulators, meaning that mating stimulates the release of the egg, and can delay

implantation, making it difficult to predict a birth. On average, gestation is 134 days (roughly four and a half months), but can range anywhere from 98 to 158 days. Female red pandas typically give birth to a litter of one to four cubs each year. Cubs grow relatively slowly and develop extended associations with mothers. Offspring will usually remain with their mother until the next litter is due, which can be over a year later.

Lifespan

The average life span of a red panda is estimated to be seven years in the wild. In captivity, red pandas often live up to ten to twelve years of age.

Behaviour

Apart from their short breeding season and when rearing young, red pandas are solitary animals. Red pandas are classified as semi-nocturnal, as they spend their nights searching for food. Eating bamboo does not provide the red panda with a lot of energy, which is needed to keep their bodies warm. As a result, red pandas sleep a lot and often find a sunny resting spot, especially during the winter months. Moreover, red pandas are notorious tree climbers, relying on trees for food, shelter, and as a mode of escaping ground-based predators. As red pandas descend head-first down trees, they are able to rotate their ankles to control their descent and are one of the few tree-climbing species capable of doing so.

Major Threats

Humans pose the greatest threat to the red panda population primarily due to

environmental degradation and poaching practices. Habitat loss and fragmentation of habitat is the fundamental threat to this species survival. Domestic and feral dogs also pose a threat to red pandas, as do snow leopards and martens.

Conservation

The red panda is designated as *vulnerable* according to the International Union for Conservation of Nature's Red List of Threatened Species Red List of Threatened Species. It is estimated that there are only 10,000 mature individuals remaining in the wild.

International breeding programs have been developed, with over 80 zoos worldwide exhibiting red pandas and participating in some form of management plan to ensure a viable captive population. In North America captive individuals are maintained and managed under a Species Survival Plan (SSP).

References

http://nationalzoo.si.edu/publications/zoogoer/1992/2/redpandasfirecat.cfm

http://redpandanetwork.org

http://www.iucnredlist.org/apps/redlist/details/714/0

http://www.cutestpaw.com/images/red-panda-baby/

Greenaway, Theresa. *Amazing Worlds. Amazing Bears*. Stoddart, Toronto. 1992.

GIANT PANDA FUN FACTS!

- **What would a full grown giant panda look like without any fur?**
  - They would be a pink and black bear! Under the panda's white fur, their skin is pink, while under their black fur, their skin is black.

- **A newborn panda cub is comparable to a stick of butter.**
  - Weighing only 85 to 140 grams, a newborn panda is 1/900th of the size of its mother.

- **A panda's paw has six digits – both paws have five fingers plus a 'thumb'!**
  - The psuedothumb is actually a wrist bone that has grown outwards to help the panda grasp bamboo stalks.

- **Giant pandas can eat up to 40 kg of bamboo in one day!**
  - Approximately 99 percent of a panda's diet – bamboo leaves and shoots – is void of much nutritional value. In order to get adequate nutrition, a giant panda must eat massive quantities of bamboo

- **Pandas are notorious for having problems mating.**
  - Female pandas ovulate once a year and they are only able to conceive during a one to three day period.

- **What sounds do pandas make?**
  - Honk... Gggrowwwl, Bleat!!

- **Giant pandas are classified as an endangered species.**
  - There is an estimated 1,600 giant pandas left in the wild and about 300 in captivity.

- **Why did the World Wildlife Fund (WWF) choose the panda for their logo?**
  - Chi-Chi, a giant panda brought to the London Zoo in 1961, inspired the first sketch of the logo. Founders wanted an animal that was beautiful, endangered and loved by many. Interestingly, they also wanted an animal that had an impact in black and white to save money on printing costs.

- **Birthday cakes are often offered to captive pandas for fun and enrichment.**
  - The cakes are made from ice and vegetables and come completed with bamboo candles.

Giant Panda Lesson Plans and Activities

Photo Credit: giantpandazoo.com

Primary Lessons –
Science Curriculum Connections

Kindergarten (Full-Day Early-Learning):

1. **Demonstrate an awareness of the natural and built environment through hands-on investigations, observations, questions, and representations of their findings.**

    1.1. Ask questions about and describe some natural occurrences using their own observations and representations

3. **Demonstrate an understanding of the natural world and the need to care for and respect the environment.**

    3.3. Identify ways in which they can care for and show respect for the environment
    3.4. Participate in environmentally friendly activities in the classroom and the schoolyard

Grade 1: Needs and Characteristics of Living Things

1. **Assess the role of humans in maintaining a healthy environment.**

    1.1. Identify personal action that they themselves can take to help maintain a healthy environment for living things, including humans
    1.2. Describe changes or problems that could result from the loss of some kinds of living things that are part of everyday life

2. **Investigate needs and characteristics of plants and animals, including humans.**

    2.2. Investigate and compare the basic needs of humans and other living things, including the need for air, water, food, warmth, and space, using a variety of methods and resources
    2.3. Investigate and compare the physical characteristics of a variety of plants and animals, including humans
    2.4. Investigate the physical characteristics of plants and explain how they help the plant meet its basic needs using a variety of methods and resources

3. **Demonstrate an understanding of the basic needs and characteristics of plants and animals, including humans.**

    3.1. Identify environment as the area in which something or someone exists or lives
    3.2. Identify the physical characteristics of a variety of plants and animals
    3.4. Describe the characteristics of a healthy environment, including clean air, water and nutritious food, and explain why it is important for all living things to have a healthy environment
    3.5. Describe how showing care and respect for all living things helps to maintain a healthy environment

Grade 2: Growth and Changes in Animals

1. **Assess ways in which animals have an impact on society and the environment, and ways in which humans have an impact upon animals and the places where they live.**

    1.2. Identify positive and negative impacts that different kinds of human activity have on animals and where they live

2. **Investigate similarities and differences in the characteristics of various animals**.

    2.2. Observe and compare the physical characteristics and the behavioural characteristics of a variety of animals, including insects, using student generated questions and a variety of methods and resources
    2.3. Investigate the life cycle of a variety of animals, using a variety of methods and resources
    2.4. Observe and compare changes in the appearance and activity of animals as they go through a complete life cycle
    2.5. Investigate the ways in which a variety of animals adapt to their environment and/or to changes in their environment, using various methods

3. **Demonstrate an understanding that animals grow and change and have distinct characteristics.**

    3.2. Identify and describe major physical characteristics of different types of animals
    3.3. Describe an adaptation as a characteristic body part, shape, or behaviour that helps a plant or animal survive in its environment

Grade 3: Growth and Changes in Plants

1. **Assess ways in which plants have an impact on society and the environment, and ways in which human activity has an impact on plants and plant habitats**.

    1.1. Assess ways in which plants are important to humans and other living things, taking different points of view into consideration, and suggest ways in which humans can protect plants

2. **Investigate similarities and differences in the characteristics of various plants, and ways in which the characteristics of plants relate to the environment in which they grow.**

    2.2. Observe and compare the parts of a variety of plants

3. **Demonstrate an understanding that plants grow and change and have distinct characteristics.**

    3.1. Describe the basic needs of plants, including air, water, light, warmth, and space
    3.2. Identify the major parts of plants, including root, stem, flower, stamen, pistil, leaf, seed, and fruit, and describe how each contributes to the plant's survival within the plant's environment
    3.3. Describe the changes that different plants undergo in their life cycles
    3.6. Describe ways in which plants and animals depend on each other

Primary Lesson Plan 1 – Panda Masks

OBJECTIVE: **Students will identify the physical characteristics of the giant panda.**

Description

While visiting the giant panda exhibit at the Toronto Zoo, students will identify the physical characteristics of the giant panda. Following their visit, students will use their observations to create their own panda masks!

Materials

- "Panda Portrait" handout
- "Panda Portrait" template
- White paper plates
- Black and pink construction paper
- Black and pink markers/crayons/pencil crayons

- White glue
- Popsicle sticks
- Scissors
- Clipboards (optional)

Lesson

Pre-Visit

Step 1: Create a KWL chart about giant pandas. As a class (or individually), complete the 1st two columns of the KWL chart. Display the chart in the classroom to act as a reminder of the upcoming visit to the Toronto Zoo. This activity will encourage students to practice making predictions and communicating their ideas to the class. It is an excellent opportunity for teachers to assess the prior knowledge of their students.

What We **KNOW**	What we **WANT TO KNOW**	What we **LEARNED**

Step 2: Introduce the term physical characteristic. Using the students as examples, identify the physical characteristics of humans (e.g. number of arms, legs, fingers, ears, etc; hair colour; hair vs fur). Record on chart paper and use as a reference for what students should be looking for when observing the pandas. This discussion may activate students' prior knowledge about pandas and they may wish to add onto the KWL chart.

For grade 2 and 3, the terms behavioural characteristic and adaptation can also be introduced, with students using themselves as examples again.

During

*Remember to bring handouts, pencils, black markers/crayons/pencil crayons, and clipboards to the Zoo

Step 3: While observing the giant pandas, students should identify a variety of their physical characteristics.

Step 4: Using the handout titled "Panda Portrait," students will sketch the face of a giant panda. They should be focusing on where the distinctive black markings are located.

- Three different versions of the "Panda Portrait" handout are provided. One is blank, one has the outline of a panda, and one is for colouring. Choose the one(s) that best fits the needs of your students.

Post-Visit

Step 5: Complete the *Learned* section of the KWL chart to assess which panda characteristics the students learned about.

Step 6: Have each student reflect on the things they learned during their visit to the Toronto Zoo. Instruct students to choose the favourite thing they learned about pandas and write one sentence (or more) about it at the bottom of the "Panda Portrait" handout.

Step 7: Using their sketches as a model, students will create a paper plate panda mask.

- Cut out (this may need to be done ahead of time by the teacher) to small, slanted ovals from the paper plates to create the eyes of the panda.
- Create ears from black construction paper and then glue them to the paper plates.
- Draw in (or use the construction paper to create) eye patches, a mouth and any other facial elements needed. See the "Panda Portrait" template for outlines of ears, eye patches, and heart-shaped cheeks (optional). Glue a popsicle stick to the back of mask, at the bottom, to act as a handle.

Extension

In addition to the KWL chart, students can complete the "Five Senses Panda Expectation Survey" before and after their visit to the Toronto Zoo. This is a great opportunity for teachers to discuss the 5 sense organs with their students. Students can compare how humans use their sense organs and whether giant pandas use their sense organs in the same manner or different.

Cross-Curriculum Connections

- Grade 1 – **Oral Communication:** 2.2, 2.3, 2.4
  Writing: 1.2, 2.1, 2.3, 2.4, 3.1, 3.2, 3.4, 3.5
  Visual Arts: D1.1, D1.4
- Grade 2 – **Oral Communication:** 2.2, 2.3, 2.4
  Writing: 1.2, 2.1, 2.3, 2.4, 3.1, 3.2, 3.3, 3.4, 3.5
  Visual Arts: D1.1, D1.4
- Grade 3 – **Oral Communication:** 2.2, 2.3, 2.4
  Writing: 1.2, 2.1, 2.3, 2.4, 3.1, 3.1, 3.4, 3.5
  Visual Arts: D1.1, D1.4

Name: _____

Panda Portrait

Try your best to draw a giant panda's face. Look at their eye patches!
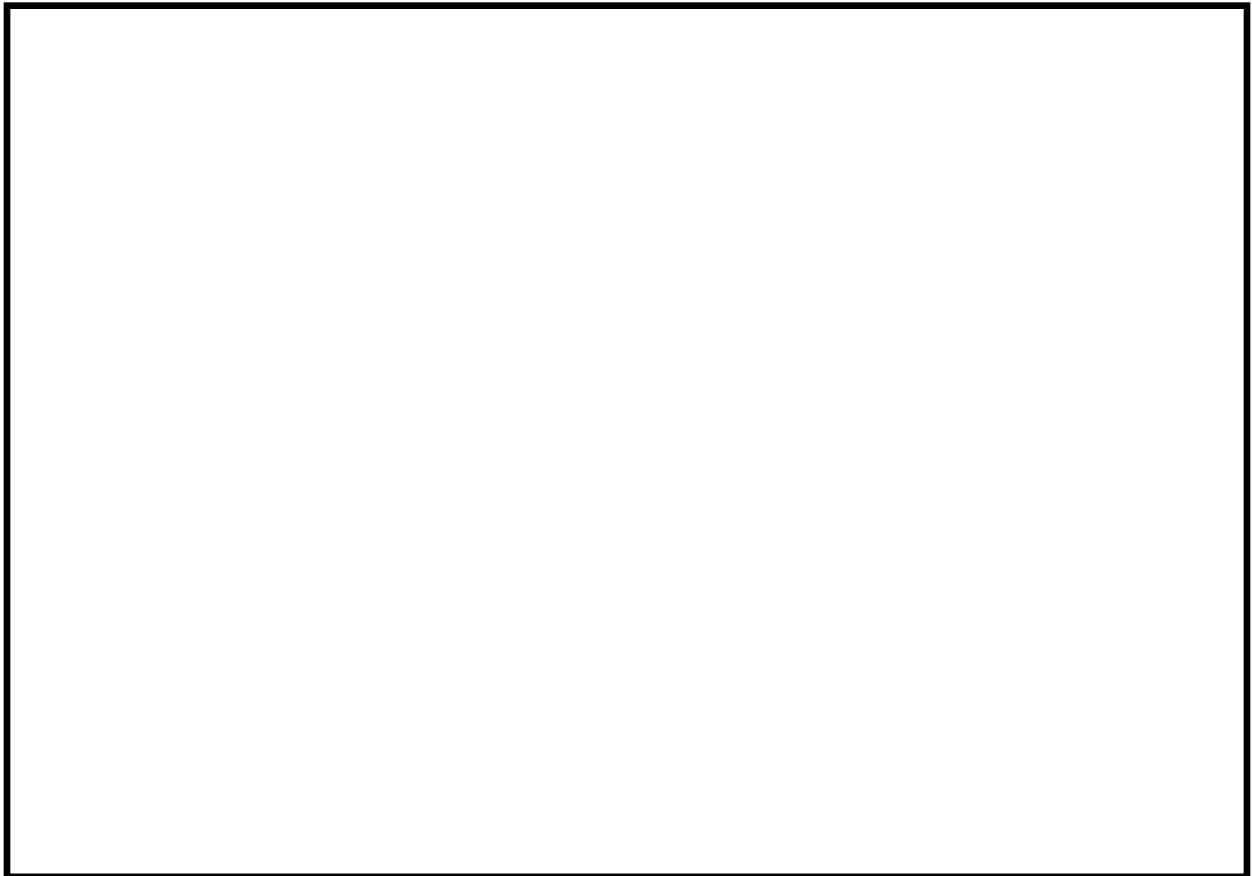
FUN Fact: Write a sentence about an interesting fact you learned about giant pandas while at the Toronto Zoo.

_____

_____

_____

_____

Panda Portrait

Try your best to draw a giant panda's face. Which parts are black and which parts are white?

FUN Fact: Write a sentence about an interesting fact you learned about giant pandas while at the Toronto Zoo.

At the Zoo, I learned _____

_____

_____

Panda Portrait

Colour in the giant panda's face. What colour are their ears, nose, and eyes?

FUN Fact:

At the Zoo, I learned that giant pandas _____

_____

_____

Panda Mask Template
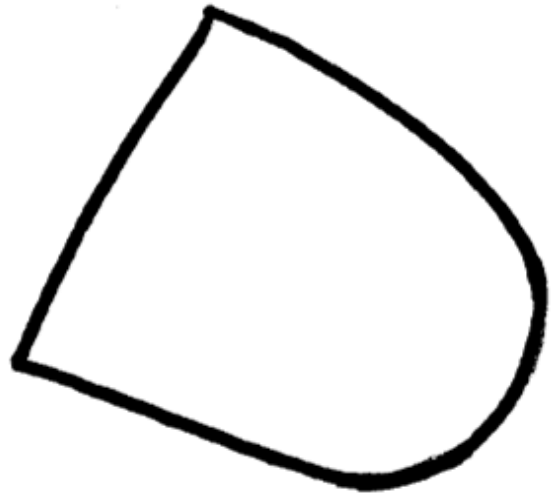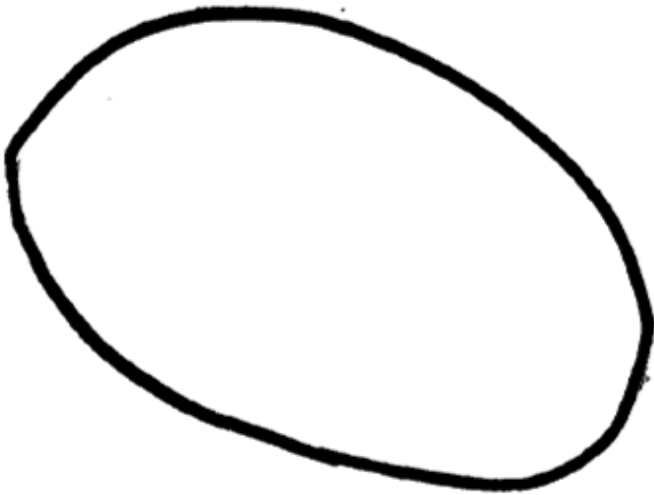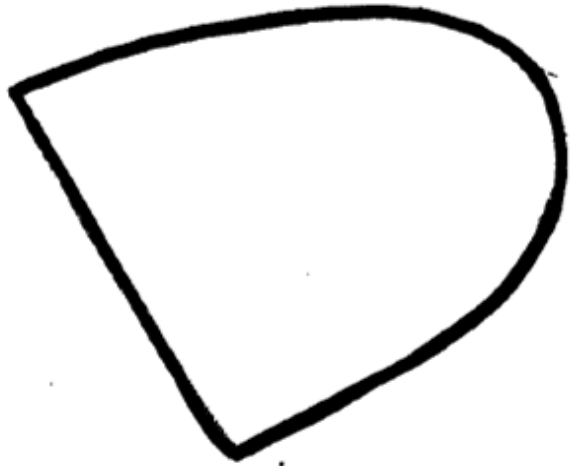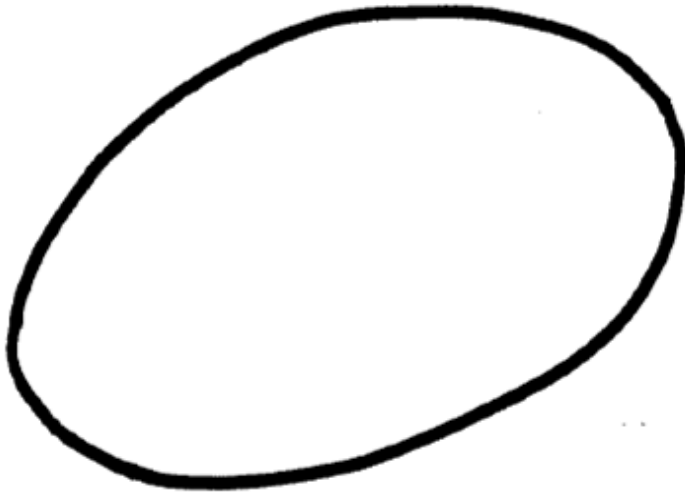
Name: _____

Five Senses Panda Expectation Survey

Before your trip to the Toronto Zoo	
Sense	**Expectation**
What do you think you will **see**?	
What do think you will **smell**?	
What do you think you will **feel or touch**?	
What do you think you will **hear**?	

After your trip to the Toronto Zoo	
Sense	**Expectation**
What did you **see**?	
What did you **smell**?	
What did you **feel or touch**?	
What did you **hear**?	

Question:

What sense is the survey missing? Why?

_____

_____

Primary Lesson Plan 2 – Comparing Pandas

OBJECTIVE: **Students will explore the similarities and differences between giant pandas and red pandas.**

Description

While giant pandas and red pandas share many unique similarities, they are two completely different species. Giant pandas have been classified by researchers as part of the bear family, whereas red pandas have been placed in their own family. In this lesson, students will visit the Toronto Zoo and observe both species of pandas to see if they can identify any of the similarities or differences that exist.

Materials

- "Venn Diagram Comparison of Giant Pandas and Red Pandas" handout
- "Panda Characteristics" handout
- Reference books on giant pandas and red pandas from school library

Lesson

Pre-Visit

Step 1: Complete steps 1 and 2 from Primary Lesson Plan 1 – Panda Masks. Create a separate KWL chart about red pandas.

Step 2: After both KWL charts have been created, introduce the students to both red pandas and giant pandas. This can be done by viewing video clips (National Geographic Kids), looking at pictures or reading through fiction/non-fiction books about both species of pandas. This will allow students to become familiar with the animals before their visit to the Zoo. Focus on physical and behavioural characteristics of the pandas and the changes at each stage of life.

During

Step 2: While at the Toronto Zoo, visit the giant panda and red panda exhibits. Both exhibits are located in the Eurasia section of the Zoo. When observing the pandas, have students identify various physical and behavioural characteristics (e.g. number of legs, fur or no fur, whiskers, colour of fur, size, etc.). Students should also take note of what a panda needs to survive (e.g. bamboo, water, shelter). Make sure to take the time and point out any interesting facts on signage posted at each exhibit.

Step 3: Create a Venn diagram to compare giant pandas and red pandas. This can be done either as a whole class (on chart paper) or individually using the Venn diagram handout (includes a bank of options for students to cut and paste if needed). Students can focus on things like their physical and behavioural characteristics, diet, geographical range, habitat, adaptations, and conservation status.

Step 4: Complete the *Learned* section of both KWL charts.

Extensions

Pre-Visit

Discuss and compare the lifecycles of giant pandas and red pandas. Use the lifecycle of a human and the growth and changes that we experience from baby to child to adult as an example. The panda (mammal) lifecycle can also be compared to the lifecycles of birds, reptiles, amphibians, or insects.

Act out each stage of the giant panda lifecycle:
- **Newborn** – Laying on the ground, crouched with eyes closed (*Note:* newborn pandas are deaf and blind and are essentially helpless, as their muscles have not yet developed; they spend most of their time drinking their mother's milk)
- **Cub** (3 or 4 months) – Begin to slowly crawl around and explore their environment, before falling asleep (*Note:* their eyes and ears have now opened)
- **Older Cub** (7 to 18 months) – Crawl around faster and begin eating bamboo (*Note:* cubs at this age would begin to climb trees to escape predators, but climbing should be avoided in classrooms)
- **Adult** (18 months+) – sleep and eat (*Note:* giant pandas eat sitting up; to practice holding bamboo like a panda, students should grip a pencil with all four fingers and then jam their bended thumb up against the pencil)

Post-Visit

Have students select their favourite species of panda and write a paragraph about describing its characteristics (length and detail dependent on level of the student).

For grade 3 students, this would be an excellent time for them to explore bamboo, particularly if they observed the giant pandas eating bamboo during their visit to the Toronto Zoo. If possible, bring in a bamboo plant (can be found in garden centres or the flower section of grocery stores) for students to observe. Students can identify the different parts of the plant (e.g. roots, stem, leaves, flower) and indicate how each contributes to the plant's survival. Students can also discuss the life cycle of bamboo, as well as the basic needs of bamboo (e.g. air, water, light, particular climate, etc.).

Cross-Curriculum Connections

- Grade 1 – **Oral Communication:** 2.2, 2.3, 2.4
  Writing: 1.2, 1.3, 1.4, 2.1, 2.3, 2.4, 3.1, 3.2, 3.4, 3.5
  Drama: B1.1 (extension)
- Grade 2 – **Oral Communication:** 2.2, 2.3, 2.4
  Writing: 1.2, 1.3, 1.4, 2.1, 2.3, 2.4, 3.1, 3.2, 3.4, 3.5
  Drama: B1.1 (extension)
- Grade 3 – **Oral Communication:** 2.2, 2.3, 2.4
  Writing: 1.2, 1.3, 1.4, 2.1, 2.3, 2.4, 3.1, 3.2, 3.4, 3.5
  Drama: B1.1 (extension)

Venn Diagram Comparison of Giant Pandas and Red Pandas

Giant Panda

Red Panda
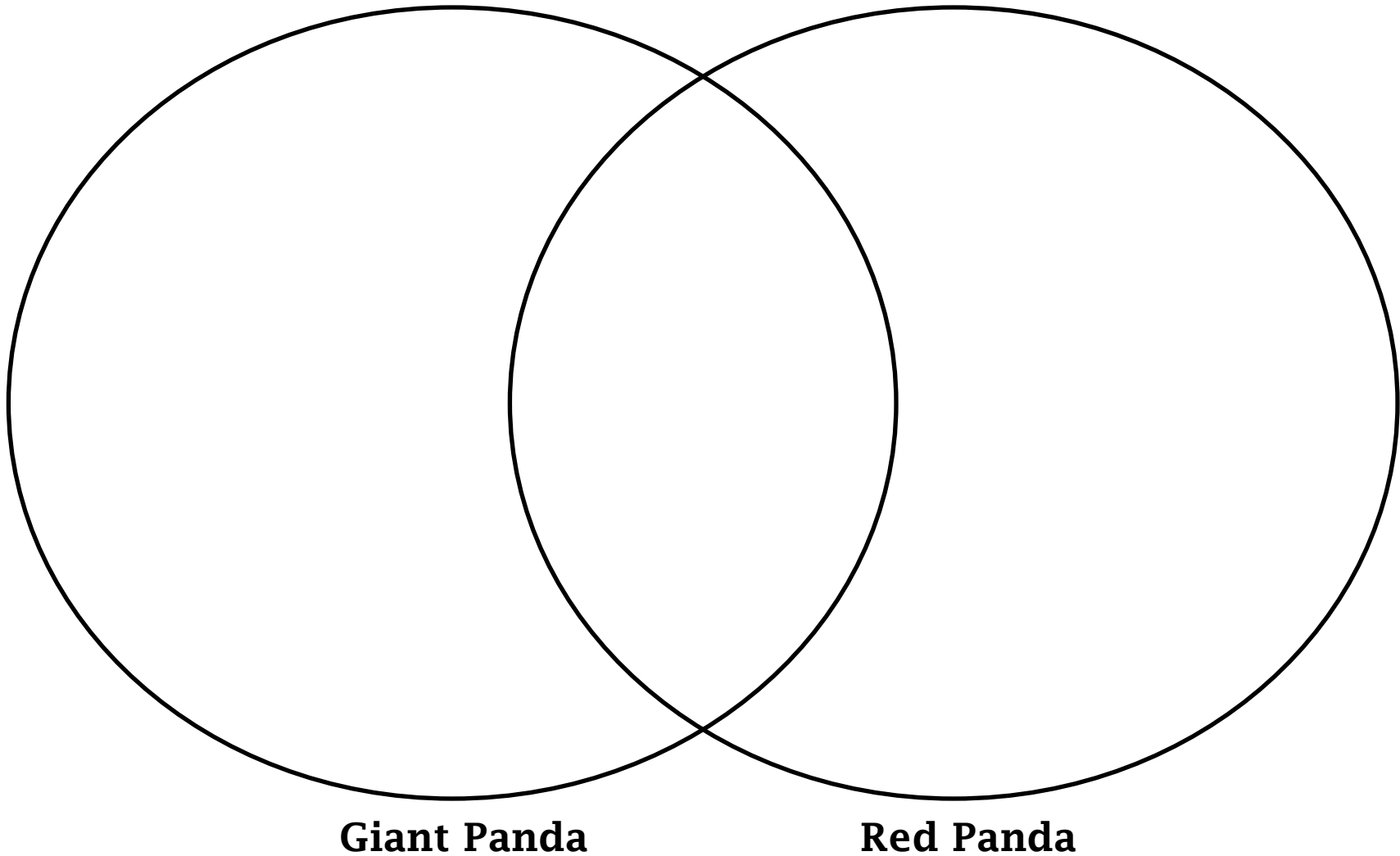
Panda Characteristics

Cut out each panda characteristic and glue it in the correct area of the Venn Diagram.

I am black and white	**I am red**
I am found only in China	**I am found in the Himalayan Mountains** (Nepal, Burma, Bhutan, China)
I eat bamboo	**I have a long, bushy tail**
I am the size of a bear	**I am the size of a raccoon**
I have a false thumb	**I like to live by myself**
I spend most of the day on the ground	**I spend most of the day high up in trees**
As a newborn, I am pink with a thin layer of fur	**As a newborn, I am covered in grayish fur**
I have sharp teeth and claws	**I spend over 10 hours a day eating bamboo**

Primary Lesson Plan 3 – How Tall Is A Giant Panda?

OBJECTIVE: **Students will explore the size of giant pandas using standard and non-standard units of measure.**

Description

This black and white mammal is known by most as an adorable, bamboo-eating bear. However, many people do not realize just how **GIANT** the giant panda really is. This lesson acts as part of an introduction to giant pandas, as well as a fun way for students to compare themselves to the size of a giant panda.

Materials

- Large pieces of white (or reused) paper or Bristol board
- Giant Panda Outline
- *Little Panda* by Joanne Ryder
- Variety of measuring units (both standard and non-standard units)
- "How Tall Is a Panda" handout

Lesson

Pre-Visit

Set-up Prior to Lesson

Step 1: Using a large piece of white paper or Bristol board, create a life-sized cut-out of a giant panda (standing on all four legs). A panda outline is provided and could be projected onto the wall to assist in sketching the panda. Tape the panda to the wall in an accessible place, ensuring that the bottom of the paws touch the floor. Keep hidden from students until you are ready to use it.

- **Measurements for an adult male giant panda:**
  - ○ *Nose to Rump:* 1.5 – 1.8 m long
  - ○ *Toes to Shoulder:* about 1 m
- **Colouring:**
  - ○ White with ***black*** legs, arms, ears, nose, and tear-like eye patches

Introduction

Step 2: Read *Little Panda* aloud to class. Students will learn how small a giant panda cub is when it is born and how it changes and grows over the course of a year. After reading the book, discuss the size of a newborn panda cub and compare it to objects students are familiar with (e.g. same weight as an apple, same length as a stick of butter). The size of a newborn panda cub can also be compared to the size of a newborn baby with the students predicting which is

bigger. Before showing students the life-sized giant panda outline, have them estimate how large (height and length) they think the adult panda will be.

Step 3: Unveil the life-sized giant panda drawing. Have students identify the height and length of the panda so that they will know where to measure.

Step 4: Depending on the level of your students, you may need to model how to measure with standard and non-standard units.

Activity
Step 5: Set up the life-sized giant panda in an accessible location in the classroom. This activity is best completed in small groups as space around the panda is limited. Provide students with a variety of measurement units and allow them to choose their preferred unit of measure.

Step 6: Students will complete the "How Tall is a Giant Panda" handout.

Consolidation
Step 7: Once all students have completed the activity, have a class discussion about how big a giant panda really is. Students can share their measurements of the giant panda, how they measured the panda, and which units of measure they used. Students can also share what objects they found that were shorter than, taller than, or the same size as the giant panda.

Extension
In addition to the life-sized adult giant panda (on all four legs) cut-out, create a life-sized version for a newborn panda and have students measure the length of it (length: 15-17 cm). Another version that could be created and measured is a giant panda standing up-right on two legs.

Cross-Curriculum Connections
- Grade 1 – **Measurement:** 1.1, 1.2, 2.1, 2.2
- Grade 2 – **Measurement:** 1.2, 1.4
- Grade 3 - **Measurement:** 1.1, 2.2

Name: _____

How Tall is a Giant Panda?

My measuring tool is:

Estimate

I estimate that I am _____ units tall

I estimate that the giant panda is _____ units tall.

Measure

I am _____ units tall.

The giant panda is _____ units tall.

Circle one

I am 🐼🐼 than a giant panda.

taller   shorter

Explore the classroom and find 2 items that are:

Taller than the giant panda		
Shorter than the giant panda		
The same size as the gaint panda		

Giant Panda Outline

Junior Lessons –
Science Curriculum Connections

Grade 4: Habitats and Communities

1. **Analyze the effects of human activities on habitats and communities.**

    1.1. Analyze the positive and negative impacts of human interactions with natural habitats and communities

    1.2. Identify reasons for the depletion or extinction of a plant or animal species

2. **Investigate the interdependence of plants and animals within specific habitats and communities.**

    2.2. Build food chains consisting of different plants and animals, including humans.

    2.3. Use scientific inquiry/research skills to investigate ways in which plants and animals in a community depend on features of their habitat to meet important needs

3. **Demonstrate an understanding of habitats and communities and the relationships among the plants and animals that live in them.**

    3.1. Demonstrate an understanding of habitats as areas that provide plants and animals with the necessities of life

    3.2. Demonstrate an understanding of food chains as systems in which energy from the sun is transferred to producers and then to consumers

    3.5. Classify organisms, including humans, according to their role in a food chain (e.g. producer, consumer, decomposer)

    3.6. Identify animals that are carnivores, herbivores, or omnivores

    3.7. Describe structural adaptations that allow plants and animals to survive in specific habitats

    3.8. Explain why changes in the environment have a greater impact on specialized species than on generalized species

Grade 5: Human Organ Systems

3. Demonstrate an understanding of the structure and function of human body systems and interactions within and between systems.

　3.1. Identify major systems in the human body and describe their roles and interrelationships

　3.2. Describe the basic structure and function of major organs in the respiratory, circulatory, and digestive systems

Grade 5: Conservation of Energy and Resources

1. Analyze the immediate and long-term effects of energy and resource use on society and the environment, and evaluate options for conserving energy and resources.

　1.1. Analyze the long-term impacts on society and the environment of human uses of energy and natural resources, and suggest ways to reduce these impacts

Grade 6: Biodiversity

3. Demonstrate an understanding of biodiversity, its contributions to the stability of natural systems, and its benefits to humans.

　3.2. Demonstrate an understanding of biodiversity as the variety of life on earth, including variety within each species of plants and animals in communities, and among communities and the physical landscapes that support them

　3.3. Describe ways in which biodiversity within species is important for maintaining the resilience of those species

Junior Lesson Plan 1 – Giant Panda Conservation

OBJECTIVE: **While learning about endangered species, including giant pandas, students will be introduced to the world of conservation.**

Description

We are currently in the midst of an extinction crisis, with the rate of plant and animal extinctions estimated to be 100 to 1000 times greater than the average extinction rate throughout evolutionary history. This crisis is leading to an incredible loss of biodiversity, which so much of life, including humans, depends upon. In this lesson, students will learn about the factors contributing to the decline of many endangered species, including giant pandas, and the conservation projects working to save them.

Materials

- *"Will We Miss Them? Endangered Species"* by Alexandra Wright
- "Will we miss the Giant Panda?" handout
- Access to reference books and the internet

Procedure

Pre-Visit

Step 1: On the board/chart paper, write the words "endangered species" in the centre. Allow students time to think about what these words mean to them (or have them write their ideas down on paper). Then, invite students to write words that they associate with "endangered species" on the board/chart paper (this can include animals or plants that are classified as endangered).

Step 2: Once everyone's ideas have been shared, engage the class in a discussion about endangered species.

Step 3: Repeat Steps 1 and 2, using the word "conservation" instead.

Step 4: Read the book *"Will we miss them? Endangered Species"* aloud to the class. The 11 year old author believed that writing about the endangered species would help to convince people that they were worth saving. Discuss with students what they believe the author's message was and what their feelings are about whether the general population would miss an animal if it became extinct. During this discussion, it is important to remind students that everything is interconnected and that the loss of one species can have a large impact on its ecosystem. It may be beneficial for your students if you have food web examples prepared for a few animals mentioned in the book.

Step 5: The giant panda was one of 13 animals mentioned in "Will We Miss Them? Endangered Species." Brainstorm as a class, the reasons why giant pandas are threatened with extinction (e.g. habitat loss, human activities, slow reproductive rates, etc.) and what impacts their extinction would have on their ecosystem. Have students complete the "Will we miss the Giant Panda?" handout, providing them with time to research additional information (reference books, websites, magazine and newspaper articles, etc.)

During

Step 6: Visit the giant pandas at the Toronto Zoo and learn about the conservation efforts happening worldwide to save this iconic endangered species. Students can then explore the rest of the Zoo and learn about a variety of other animals that are "at risk."

Post-Visit

Step 7: Students will choose an endangered species. You can put restrictions on their choice of species, such as a Canadian animal, or leave it open-ended. Each student will research their chosen species and create a one-page report/book page. The content and format of the report can be decided by you or together as a class. Possible topics to include are: a short description of the species, its habitat, diet, factors threatening its survival, conservation efforts, and why we will miss them if they disappear. Each student should also create a one-page illustration of their chosen species with their habitat as the background.

Step 8: Once all of the reports/book pages are complete, bind them together, along with a cover page and animal illustrations, into a class version of the book "Will we miss them?"

Step 9: In small groups, have students share the book with students in other classes.

Extensions

In a high-traffic area within the school (front lobby, main hallway, library, etc.), create a "Will We Miss Them?" display, mapping the location of endangered species around the world. On a large map of the world, students will locate and mark the home of their chosen species with a flag/pin. Students should create a graphic for their species, which will surround the map. The graphic should include the name of the species, an illustration (drawing/photograph) of it, and the reasons why it is endangered. Pieces of string will be used to connect the flags to graphics.

During this lesson, students should have learned about various conservation-related organizations and the major conservation efforts they are spear-hearing worldwide. Now it's their turn – students will brainstorm ideas of what they can do in their everyday lives to conserve. Students will then pledge one of these ideas. These pledges should be written down and displayed in the classroom to remind students of how they are helping the environment.

Cross-Curriculum Connections

- Grade 4 – **Oral Communication:** 1.2, 1.3, 1.4, 1.6, 2.2, 2.3, 2.4, 2.5
  Reading: 1.1, 1.4, 1.5, 1.6, 1.7, 1.8
  Writing: 1.2, 1.3, 1.4, 1.5, 1.6, 2.1, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 3.7, 3.8
  Visual Arts: D1.1, D1.2, D1.3, D1.4

- Grade 5 – **Oral Communication:** 1.2, 1.3, 1.4, 1.6, 2.2, 2.3, 2.4, 2.5
  Reading: 1.1, 1.4, 1.5, 1.6, 1.7, 1.8
  Writing: 1.2, 1.3, 1.4, 1.5, 1.6, 2.1, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 3.7, 3.8
  Visual Arts: D1.1, D1.2, D1.3, D1.4

- Grade 6 – **Oral Communication:** 1.2, 1.3, 1.4, 1.6, 2.2, 2.3, 2.4, 2.5
  Reading: 1.1, 1.4, 1.5, 1.6, 1.7, 1.8
  Writing: 1.2, 1.3, 1.4, 1.5, 1.6, 2.1, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 3.7, 3.8
  Visual Arts: D1.1, D1.2, D1.3, D1.4

Will We Miss Giant Pandas?

Giant pandas are classified as endangered, with only an estimated 1,600 left in the wild. Without major conservation efforts, the giant panda is heading towards extinction. The question is – Will we, or the rest of the world, miss giant pandas if they disappear?

1. Where are giant pandas found in the wild? _____

2. List the reasons leading to the decline in the giant panda population (minimum of four).

3. Using one of the reasons you listed above, explain in detail, why that factor is negatively affecting giant pandas?

_____

_____

_____

_____

_____

_____

_____

4. Will we miss giant pandas if they go extinct? Why or why not?

_____

_____

_____

_____

_____

_____

_____

5. Name one organization that is helping to conserve giant pandas. What are they doing to help?

_____

_____

_____

_____

_____

Junior Lesson Plan 2 – Bamboo Eaters

OBJECTIVE: **By constructing models/diagrams, students will compare a human's digestive system to that of a giant panda.**

Description

Even though giant pandas are classified as carnivores, bamboo makes up an amazing 99 % of their diet. In this lesson, students will learn about digestive systems, comparing the structure and function of digestive organs in humans to those found in giant panda. Students will also explore the adaptations that allow giant pandas to digest bamboo.

Materials

- Chart paper
- "Giant Panda Diet" factsheet
- Markers/crayons/pencil crayons
- Variety of craft materials
- Large roll of brown craft paper
- "Capture the Bamboo" rules (extension)

Lesson

Pre-Visit

Step 1: As a class, have students brainstorm words that they associate with the digestive system (starts at the mouth and ends at the anus). Record these ideas on chart paper. Follow with a class discussion about the digestive system and the role that it serves (e.g. process of turning food into energy for the body).

Step 2: Students can also discuss whether they think that different animals will have differences in their digestive systems, keeping varying diets (carnivores, herbivores, and omnivores) and different species (amphibians, birds, fish, insects, mammals, and reptiles) in mind. At this time, you can introduce giant pandas into the conversation and ask students what they think the giant panda's digestive system might look like, as the panda is a carnivore whose diet is 99% bamboo. Students may also choose to discuss the structural adaptations that allow the giant panda to eat bamboo (e.g. strong jaw muscles, large molars, pseudo-thumb, etc.). A "Giant Panda Diet" factsheet accompanies this lesson for your reference.

Step 3: Divide the class in half. One half of the class will be working together to create a human digestive system, while the other half will be working on a giant panda digestive system. To start, students will need an outline of the human body (trace a student) and giant panda (see outline provided in *Primary Lesson 3 – How Tall is a Giant Panda*) on brown craft paper. For both halves of the class, assign each student or pair of students one or two organs found within the digestive system. Students are to research their assigned organs and learn about what the structure looks like, how it functions, and why it is important. Provide students with reference material or access to computers/internet and/or the library so they can research their organs. All students will then add their organ(s) to the body, along with a summary of their research. The organs can either be drawn on or can be created out of various craft materials and attached to the body. Students will have to work together to ensure all organs are in the correct positions and are an appropriate size. Below is a list of suggested organs that could be included:

Mouth	Stomach	Duodenum
Teeth	Liver	Bowel
Tongue	Pancreas	Rectum
Salivary Glands	Small Intestine	Anus
Esophagus	Large Intestine	Peritoneal Cavity

Step 4: Starting with the human digestive system, students will take turn presenting the organ(s) that they researched and teaching the rest of the class about its structure and function. It is important for students to present in the order that the organs are found within the digestive system so that they understand how the organs are connected and how food is actually digested. After the giant panda digestive system is presented, students can discuss any differences that they notice between the two digestive systems.

Step 5: Display both diagrams in a location where students can easily refer to them.

During

Step 6: Visit both the giant panda and red panda exhibits at the Toronto Zoo, as well as the Giant Panda Interpretive Centre, which has a section devoted to bamboo. As giant pandas spend much of their day eating bamboo, there is a high probability that students will have an opportunity to observe the pandas eating.

Post-Visit

Step 7: Choosing an animal that they saw during their trip to the Toronto Zoo, each pair of students will draw or create a replica digestive system for their chosen animal, as was done previously for the human and giant panda. As students should already have an idea of the roles that the major organs play in the digestive system, a written description or class presentation about their animal's digestive system should focus on its differences when compared a human or giant panda.

Extensions

Play a game of "Capture the Bamboo."

Create a food chain/web for the community that inhabits the mountainous bamboo forests of China, including giant pandas. Each chain/web should consist of a variety of plants and animals, including humans. Once created, students can classify organisms as producers, consumers, or decomposers, and identify animals as carnivores, herbivores, or omnivores. Additionally, students can indicate the transfer of energy within their food chain/web, beginning with the sun.

Cross-Curriculum Connections

- Grade 4 – **Oral Communication:** 2.2, 2.3, 2.4, 2.5, 2.6, 2.7
  Reading: 1.3, 1.4, 1.6, 3.1
  Writing: 1.2, 1.3, 1.4, 1.5, 1.6, 2.3, 2.4, 2.6, 2.7, 2.8, 3.6, 3.7, 3.8
  Physical Education: A1.1, A3.1, B2.1, B2.3
- Grade 5 – **Oral Communication:** 2.2, 2.3, 2.4, 2.5, 2.6, 2.7
  Reading: 1.3, 1.4, 1.6, 3.1
  Writing: 1.2, 1.3, 1.4, 1.5, 1.6, 2.3, 2.4, 2.6, 2.7, 2.8, 3.6, 3.7, 3.8
  Physical Education: A1.1, A3.1, B2.1, B2.3
- Grade 6 – **Oral Communication:** 2.2, 2.3, 2.4, 2.5, 2.6, 2.7
  Reading: 1.3, 1.4, 1.6, 3.1
  Writing: 1.2, 1.3, 1.4, 1.5, 1.6, 2.3, 2.4, 2.6, 2.7, 2.8, 3.6, 3.7, 3.8
  Physical Education: A1.1, A3.1, B2.1, B2.3

Capture the Bamboo Rules

This game is similar to "Capture the Flag" and is best played outside in the schoolyard where there are areas available to hide the "bamboo." The first team of pandas to capture the bamboo is declared the winner.

Materials
- Large playing area
- Class set of pinnies (2 to 3 colours)
- Two flags
- Pylons

Set-up
- As a class, determine the playing boundaries.
  - Divide the space in half (using pylons to mark the dividing line) to create territories for each team.
  - Within each territory, determine a location for "the cage."
- Divide the class into two equal teams – "Giant Pandas" vs. "Red Pandas" – and give each team a different colour pinny.
- Choose two students to be "poachers" (explained below).
- Choose two identical items to serve as the "bamboo."
  - Brightly coloured, preferably green
  - Approximately 30 cm x 30 cm

Playing the Game
- Each team will retreat into their territory and hide their bamboo (should be visible from 10 m away on at least one side).
- As a team, students will decide if they are a "forager" or a "defender"
  - **Forager:** sneak into the opposing team's territory, locate the bamboo, capture it, and return to their territory without being caught
  - **Defender:** Protect the bamboo and catch opposing players (by tagging below the shoulders).
- Players who are caught by defenders are taken to "the cage." They can be released by being tagged by a team member. Both team members must immediately return to their territory. Only 1 student can be freed at a time.
- **Poachers:**
  - Their job is to capture as many pandas (from both teams) as possible
  - Once a panda is captured, the poacher must escort the panda to the opposing team's "cage"

Winning the Game
- The game is won when one team successfully captures the other teams' bamboo and is able to bring it back to their territory without being caught
- If a player is caught with the bamboo, they are sent to "the cage" and the bamboo is returned to its hiding spot.

Panda Diet Fact Sheet

Diet

In the wild, a giant panda's diet is made up of 99 % bamboo. Pandas may spend up to 16 hours a day foraging for and eating bamboo. On average, they consume approximately 20 kilograms of bamboo daily. When available, giant pandas may occasionally eat small amounts of fish, honey, eggs, leaves, fruit, and root vegetables. Additionally, they will eat small mammals and birds if they can catch them! In captivity, bamboo makes up 80-95 % of their diet, which is often supplemented with high-fibre leaf biscuits, rice gruel, carrots, apples, and sweet potatoes.

Digestive System

One of the reasons why scientists have classified giant pandas as bears is due to their digestive system, which closely resembles the carnivorous digestive systems found in bear species worldwide. Herbivores possess specialized digestive tracts, which can be either a rumen or a relatively large caecum, that, along with a host of microbes and bacteria, allow plant material to be broken down and digested. While they eat primarily plant matter, the giant panda's digestive tract is fairly short and it lacks a caecum, which means that very little of the bamboo's cellulose undergoes microbial digestion. As a result, giant pandas only digest approximately 20 % of the bamboo they eat and the rest is passed as waste (it can pass through the digestive tract in as little as eight hours). Comparatively, carnivores are usually able to extract 60 to 90 % of the energy from their diet. To compensate for their inefficient digestion, a panda must consume large amounts of bamboo daily, which can range from 20 kg to almost 40 kg a day. Studies have shown that, as the seasons change, giant pandas have the ability to preferentially select the most nutritious parts of the bamboo plant to eat, preferring bamboo stems in the winter and early spring, shoots in the spring and early summer, and leaves in the late summer and fall. Additionally, when not foraging for or eating bamboo (10-16 hours), giant pandas spend most of their time resting or sleeping, allowing them to conserve their energy.

Why Bamboo?

So, why *do* giant pandas eat bamboo? It is well known that giant pandas love bamboo, but why do they eat it if they are unable to properly digest it? After decades of research, scientists have still been unable to determine an evolutionary reason for why giant pandas chose their bamboo diet. Unlocking this mystery is made more difficult because giant pandas will occasionally eat meat when available, but they are unskilled predators and are rarely able to catch their own meal. One hypothesis that researchers have made is that pandas may have chosen to rely on bamboo because it is available year-round in their habitat. Other researchers and scientists have theorized that giant pandas eat bamboo because of a genetic mutation that has linked dietary choices to taste preference.

Feeding Adaptations

Their bamboo diet has led to giant pandas having many specialized feeding adaptations. While eating, pandas tend to sit upright in a position resembling a human sitting on the floor. This is the preferred position because it leaves the front paws free to grasp bamboo stems with the help of their "pseudo thumbs." The pseudo thumb or sixth digit is formed by an elongated and enlarged wrist bone that is covered by a fleshy pad of skin. The bamboo stalks rest on the enlarged wrist bone and are then gripped by the other five digits on the paw. Another feeding adaption of the giant panda is the size and shape of their head, which is larger and rounder than other species within the bear family. The larger and rounder head is a result of strong and powerful jaw muscles that, along with their large and jagged molar teeth, allow pandas to easily crush and slice the tough and fibrous bamboo into small pieces. Both their esophagus and stomach have tough, mucus linings that helps prevent against injury from bamboo splinters.

Water

Wild giant pandas obtain the majority of the water they need to survive directly from the bamboo they are consuming. Bamboo is a species of grass that is composed of about 50 % water (new shoots are roughly 90 % water). In addition to the water they obtain from bamboo, giant pandas will also drink fresh water from nearby rivers and streams that are fed by melting snowfall in high mountain peaks or rainfall.

Junior Lesson Plan 3 – A GIANT Legend

OBJECTIVE: **Through an ancient Tibetan giant panda legend, students will explore the text features of myths and legends.**

Description

With their white bodies and black markings, giant pandas are a unique looking animal. While no one quite knows why giant pandas look the way they do, there is an ancient Tibetan legend that tells the story of how pandas got their black markings. After reading the legend, students create their own animal-related legend.

Materials

- A Giant Panda Legend
  - *A Tibetan Legend – How the Giant Panda got its Markings* (included in package) or *The Legend of the Panda* by Linda Granfield
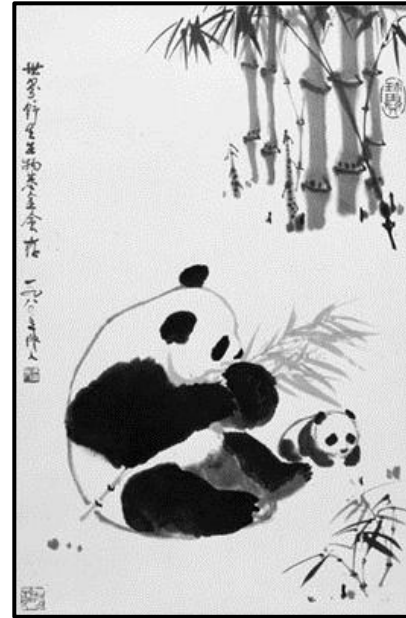
Photo © WWF-Canon / WWF Intl./ Wu Tso-Jen

Lesson

Pre-Visit

Step 1: To assess the class's prior knowledge of legends and myths, ask students to share any legends or myths that they know. Discuss the text features of myths and legends that allow them to be classified as such.

Step 2: As a class, read the accompanying Tibetan giant panda legend (or *The Legend of the Panda*).

Step 3: Have students brainstorm other animals that have unique characteristics and could have a legend/myth written about them.

During

Step 4: After visiting the giant pandas and exploring the rest of the Toronto Zoo, have students choose an animal that they will write a legend/myth about. Make sure that they note the physical and behavioural characteristics of the animal and anything else they think is interesting or important.

Step 5: Students will write a legend/myth about an animal of their choice, going through each stage of the writing process.

Step 6: Once complete, students will share their legends/stories (e.g. whole class, small groups, younger students)

Cross-Curriculum Connections

- Grade 4 – **Oral Communication:** 1.3, 1.4, 1.7, 2.2, 2.3, 2.4, 2.5, 2.6
  Reading: 1.1, 1.4, 1.7
  Writing: 1.2, 1.3, 1.4, 1.5, 2.1, 2.2, 2.3, 2.4, 2.6, 2.7, 2.8, 3.6, 3.7, 3.8
- Grade 5 – **Oral Communication:** 1.3, 1.4, 1.7, 2.2, 2.3, 2.4, 2.5, 2.6
  Reading: 1.1, 1.4, 1.7
  Writing: 1.2, 1.3, 1.4, 1.5, 2.1, 2.2, 2.3, 2.4, 2.6, 2.7, 2.8, 3.6, 3.7, 3.8
  Social Studies – *Early Civilizations*: 1.5, 3.2
- Grade 6 – **Oral Communication:** 1.3, 1.4, 1.7, 2.2, 2.3, 2.4, 2.5, 2.6
  Reading: 1.1, 1.4, 1.7
  Writing: 1.2, 1.3, 1.4, 1.5, 2.1, 2.2, 2.3, 2.4, 2.6, 2.7, 2.8, 3.6, 3.7, 3.8

A Tibetan Legend –
How the Giant Panda got its Markings

Long ago, a young and beautiful girl lived in the Wolong Valley with her family. She was a shepherdess, loved by all who knew her for her kindness and good nature. Whenever she took her sheep into the hills, a young giant panda would come to join her flock, perhaps mistaking them as its own kind, for in those days, pandas were all white.

One day, the panda arrived as usual, but it had not been playing with the flock for long when a snow leopard jumped from a tree and began to attack the helpless cub. Trying to save the defenseless panda, the little girl charged the leopard with a large bamboo shoot, striking him over and over again. The leopard was not hurt by the bamboo and turned on the little girl instead. This act of bravery saved the panda's life, but the little girl lost hers in the struggle.

When the other pandas heard this, they were stricken with grief. Pandas from far and wide came to attend the girl's funeral, and as a mark of their respect they covered their arms with ashes as was the custom.

At the funeral, they could not contain themselves. As they wept for the shepherdess, they wiped their eyes with their paws, they covered their ears to block out the sound of the crying, and they hugged each other in grief. As they did these things the ashes spread and blackened their fur. The pandas did not wash the black off their fur as a way to remember the girl. To this day, pandas are covered with the black markings to always remember.

Overcome with sorrow, the girl's three sisters threw themselves into her grave, whereupon the earth shook and in place of the grave a huge mountain appeared. That mountain still stands, and is called Siguniang—the Four Sisters Mountain. Each sister was transformed into one of its peaks, and between the ridges that spread from it, the sisters continue to protect the pandas to this day.

Photo © wang tao

References
http://pandajaan.tripod.com/Panda%20Story.htm

Intermediate Lessons –
Science Curriculum Connections

Grade 7: Interactions in the Environment

1. **Assess the impacts of human activities and technologies on the environment, and evaluate ways of controlling these impacts.**

    1.2. Analyze the costs and benefits of selected strategies for protecting the environment

2. **Investigate interactions within the environment, and identify factors that affect the balance between different components of an ecosystem.**

    2.1. Use scientific inquiry/research skills to investigate occurrences that affect the balance within a local ecosystem

3. **Demonstrate an understanding of interactions between and among biotic and abiotic elements in the environment.**

    3.1. Demonstrate an understanding of an ecosystem as a system of interactions between living organisms and their environment.

    3.8. Describe ways in which human activities and technologies alter balances and interactions in the environment.

Grade 8:

The intermediate lesson plans provided in this Teacher Resource Package do not directly connect with four strands covered in the grade 8 science curriculum. However, the lessons are still valuable, covering the important topic of conservation and providing students with the opportunity to strengthen their leadership, communication, researching, and problem-solving skills. Additionally, the lessons link to other subject areas in the grade 8 curriculum.

Intermediate Lesson Plan 1 – A Black and White Debate

OBJECTIVE: **While exploring the conservation efforts associated with giant pandas, students will communicate their knowledge through debates.**

Description

Strong communication skills are some of the most important skills students will need to be successful in the workplace. By participating in the *"Black and White Debate"*, students will not only learn about giant pandas and associated conservation efforts, but will also work on developing their communication skills. The focus of the debate should not be on who wins and who loses, but rather on learning how to effectively communicate one's point of view and supporting it with evidence.

Materials

- Notebook/paper
- Clipboard
- Pencils
- Access to computers

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Lesson

Pre-Visit

Step 1: Introduce/re-introduce your students to the concept of a debate (e.g. definition, purpose, process, arguments, determining the outcome, etc.). Working in teams, students will take (or be assigned) a position and argue either for or against a controversial subject.

Step 2: Facilitate a few practice debates with the whole class. Set-up the classroom with "for" and "against" sides and pick a few topics that your students will relate to (e.g. Should the school day be longer? Should violent video games be banned?). Allow them to choose a side and have the two sides alternate arguments/rebuttals. Try to engage all students and remind students to respect the opinions of their classmates.

Step 3: Split class into groups of 4-6 students and assign them a debate topic related to giant pandas, endangered animals, or conservation (or allow them to choose their topic). Further divide each group in half (2-3 students), with one half forming the "for" side and the other half forming the "against" side. Sample topics include:

- Should a red panda be called a "panda"? Is it a panda?
- Are pandas more closely related to bears than raccoons?
- Are animal needs as important as human needs?
- Is habitat loss the primary threat to endangered species? Giant Pandas?
- Is it important to conserve endangered species?
- Money and effort should be focused on conserving animals in their natural habitats, not in zoos.
- Should giant pandas be allowed to go extinct?

During

Step 4: Visit the Toronto Zoo and explore the Giant Panda Exhibit (including the Giant Panda Interpretive Centre). Students should take the time to watch the giant pandas and to read the informative graphics posted surrounding the exhibit. Depending on their topic, students may also need to explore other areas of the Zoo. Students should record observations or information that is relevant to their topic in a notebook or on paper.

Post-Visit

Step 5: Provide students with enough time to research their debate topic and to work with their group to formulate their arguments.

Step 6: Decide as a class, how the "winner" of each debate will be chosen, remembering that the focus is on how well the argument was presented and not which side was right and which side was wrong.

Step 7: Debate.

Extension

Following the debate, have each individual student write a persuasive letter about their topic. Students can switch sides if they choose.

Cross-Curriculum Connections

- Grade 7 – **Oral Communication:** 1.2, 1.3, 1.6, 1.7, 1.9, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7
  Reading: 1.1, 1.4
  Writing: 1.2, 1.3, 1.4, 1.5, 1.6, 2.1, 2.2, 2.3, 2.4, 2.7, 2.8, 3.6, 3.7, 3.8 (extension)
- Grade 8 – **Oral Communication:** 1.2, 1.3, 1.6, 1.7, 1.9, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7
  Reading: 1.1, 1.4
  Writing: 1.2, 1.3, 1.4, 1.5, 1.6, 2.1, 2.2, 2.3, 2.4, 2.7, 2.8, 3.6, 3.7, 3.8 (extension)
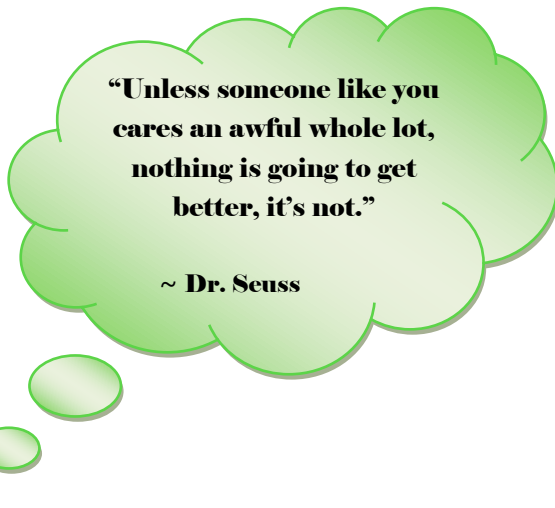
Intermediate Lesson Plan 2 – Taking a Stand and Saving Giant Pandas

OBJECTIVE: **Students will work together to raise awareness about the issues facing giant pandas and the action we need to take to save them.**

Description

With only an estimated 1,600 giant pandas left in the wild today, it is time to stand up and save the giant pandas before they disappear forever. Young people today are more socially conscious than prior generations and have the power to make a difference by influencing their community. In this lesson, students will work together to create a campaign with the goals of raising awareness about the giant pandas and conservation and instigating change in their school and community

"Unless someone like you cares an awful whole lot, nothing is going to get better, it's not."

~ Dr. Seuss

Materials

- "Campaign Ideas" handout

Lesson

Pre-Visit

Step 1: On the board/chart paper, write the word "conservation" in the centre. Allow students time to think about what these words mean to them (or have them write their ideas down on paper). Then, invite students to write words that they associate with "conservation" on the board/chart paper.

Step 2: Once everyone's ideas have been shared, engage the class in a discussion about conservation, including how it relates to the endangered giant panda, allowing their questions and comments to direct the discussion.

Step 3: Introduce students to campaigns, including the definition, their purpose, how to prepare a campaign, and the keys to a successful campaign (e.g. effective word choice, engaging storyline, target audience, etc.). Provide students with examples of successful campaigns (e.g. banning the use of the pesticide DDT and the subsequent recovery of the bald eagle population) and unsuccessful campaigns (e.g. City of Toronto's attempt to ban the sale of shark fins).

Step 4: Visit the Toronto Zoo and explore the Giant Panda Exhibit and Interpretive Centre. Students should take the time to watch the giant pandas and to read the informative graphics, particularly those about conservation efforts.

Step 5: As a class, brainstorm possible campaign topics and mediums (see *"Campaign Ideas"* handout for suggestions). This activity should be left open-ended so that students can choose the best medium for them to get their message across. The campaigns may be specific to giant pandas and steps we can take to conserve them or students can create a more generalized campaign that focuses on what we can do in our everyday lives to help protect the environment, using the giant panda as an example of an animal "at risk" due to our actions.

Step 6: Assign groups or allow students to choose based on their campaign ideas. Group size can vary, but two to three students per group is ideal.

Step 7: Allow students time to research, plan, create, and implement their campaigns. Meet regularly with each group to ensure that students are on the right track. Have students share their campaigns within the school and possibly the community.

Extension

Expand the focus of the campaign from the giant panda to other high profile endangered animals and conservation efforts. Some examples include:

- Elephants and ivory
- Gorillas, coltan, and cell phone recycling
- Orangutans and palm oil
- Polar bears and climate change
- Rhinos and their horn
- Sharks and shark fin soup
- Sustainable seafood
- Tigers, poaching, and habitat loss

Cross-Curriculum Connections

- Grade 7 – **Oral Communication:** 2.2, 2.3, 2.4, 2.5, 2.6, 2.7
  Reading: 1.3, 1.4, 1.6
  Writing: 1.2, 1.3, 1.4, 1.5, 2.2, 2.3, 2.7, 2.8, 3.6, 3.7, 3.8
  Media Literacy: 3.1, 3.2, 3.3, 3.4
  Visual Arts: D1.1, D1.3, D1.4 (dependent on campaign choice)
- Grade 8 – **Oral Communication:** 2.2, 2.3, 2.4, 2.5, 2.6, 2.7
  Reading: 1.3, 1.4, 1.6
  Writing: 1.2, 1.3, 1.4, 1.5, 2.2, 2.3, 2.7, 2.8, 3.6, 3.7, 3.8
  Media Literacy: 3.1, 3.2, 3.3, 3.4
  Visual Arts: D1.1, D1.3, D1.4 (dependent on campaign choice)

Campaign Ideas

To get you started on the *"Save the Panda Campaign"*, here are some campaign ideas. These are only suggestions and students are likely to be more engaged in the project if they have a say in their campaign, so be sure to hold a brainstorming session with the class.

- Write and send a persuasive letter to government officials or other relevant people

- Public Service Announcement
  - Radio
  - Television
    - Student actors
    - Stop-motion animation
    - Cartoon
    - Picture Slideshow
  - Print
    - Poster
    - Newspaper/magazine
    - Brochure
    - Flyer
  - In-person
    - Public lecture/speech
    - Town-hall meeting
    - Run a booth)
  - Internet
    - Blog
    - Social Media
    - Informative website

- Fundraise and donate funds to an environmental organization

- Promote eco-friendly tips

Intermediate Lesson Plan 3 – Panda "Trash" Art

OBJECTIVE: **Using recycled and reused materials, students will explore their creative side while creating giant panda "sculptures."**

Description

The giant panda has become an international symbol of wildlife conservation efforts. Worldwide, people recognize the giant panda as a critically endangered species that is at risk of going extinct. In this lesson, students will work together to create a giant panda "sculpture" made entirely from recycled and reused materials.

Plastic Bag Polar Bear
Photo © 185Queens

Materials

- Hot glue guns, white glue, and/or tape
- A large quantity of recycled and reused materials (e.g. egg cartons, cardboard, toilet paper rolls, old CDs, magazines/newspaper, bottles, plastic bags, etc.)

Lesson

Pre-Visit Activity

Step 1: As a class, view images of iconic sculptures and discuss each one (e.g. the feelings the sculptures convey, the purpose they serve, the materials they were made of, etc.). Be sure to include some images of sculptures created from "trash." A quick internet search will provide you with many images to use.

Step 2: Students will be creating their own "trash" art masterpieces that relate to giant pandas. Depending on time constraints, materials available, and space, this activity can be done as a whole class, small groups, pairs, or individually. At some point during this project, there should be a class discussion about recycling/reusing materials and its importance to conservation efforts worldwide (not just panda related).

The Hague's Recycled Tires Elephant Sculpture
Photo © Ana Lisa Alperovich for Inhabitat

Step 3: Students will visit the giant pandas at the Toronto Zoo and brainstorm sculpture ideas and what recycled materials they will need to create their sculpture.

Post-Visit Activity

Step 4: Provide students with guidelines of what is expected from them (e.g. size of sculpture, amount of detail required, etc.)

Step 5: Before building the sculpture, students will first sketch their idea, indicating approximate dimensions and possible materials that will be used. Students should also have an idea of the message (ideally conservation related) that they are trying to convey with their sculpture.

Step 6: Create and build the giant panda "trash" art sculptures.

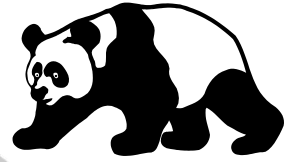**Step 7:** Display the artwork either within the classroom or around the school. Hold a gallery walk where students can observe their classmates' work. Invite other classes to take a look at the art and have students share the conservation messages their sculptures express.

Cross-Curriculum Connections
- Grade 7 – **Visual Arts**: D1.1, D1.3, D1.4, D2.2
- Grade 8 – **Visual Arts**: D1.1, D1.3, D1.4, D2.2

Name: _____

Giant Panda Word Search

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

Word Wall

Bamboo	Da Mao	Mountains
Black	Endangered	Red Panda
Carnivore	Er Shun	Shaanxi
China	Gansu	Shoots
Conservation	Giant Panda	Sichuan
Cub	Leaves	White

Giant Panda Word Search (ANSWER KEY)

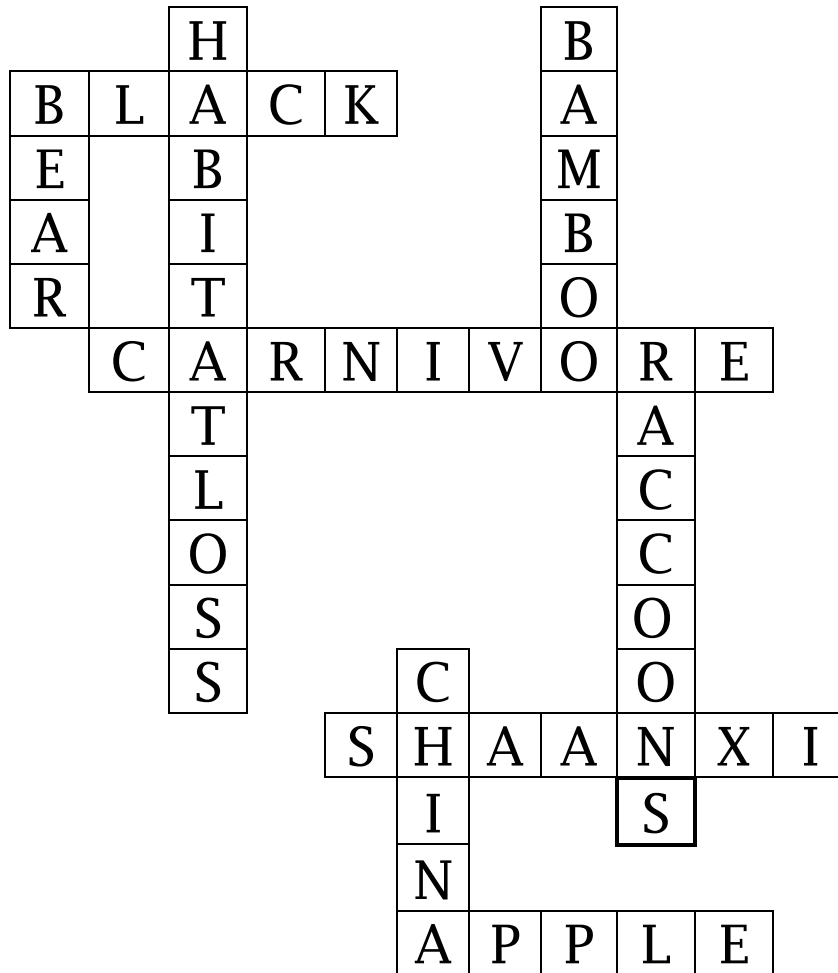| B	A	M	B	O	O	C	N	O	W	I	E	P	G
Z	R	A	C	C	O	O	N	U	A	H	A	T	C
D	E	R	E	G	N	A	D	N	E	M	I	F	D
P	U	S	R	S	H	A	A	N	X	I	A	T	H
X	T	W	I	C	H	U	A	N	R	P	C	D	E
M	S	C	W	C	J	L	Z	W	T	G	O	N	I
O	A	H	E	G	I	A	N	T	P	A	N	D	A
U	E	U	O	I	T	R	H	L	O	N	S	Q	D
N	R	A	A	O	E	A	S	E	P	S	E	E	N
T	O	C	U	B	T	D	E	R	A	U	R	O	A
A	V	H	K	L	J	S	V	S	B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

Giant Panda Crossword

CLUES

Across

1. The ears, eye patches, and nose of the giant panda are _____ in colour.

2. Even though they eat mostly plants, giant pandas are classified as _____.

7. Giant pandas live in three Chinese provinces: Sichuan, Gansu, and _____.

8. A newborn giant panda weighs less than a(n) _____.

Down

1. _____ _____ is one reason why giant pandas are endangered.

2. _____ makes up 99% of a giant panda's diet.

3. Through genetic testing, it was discovered that the giant panda is a _____.

5. Due to the patches around their eyes, scientists originally believed that giant pandas were related to _____.

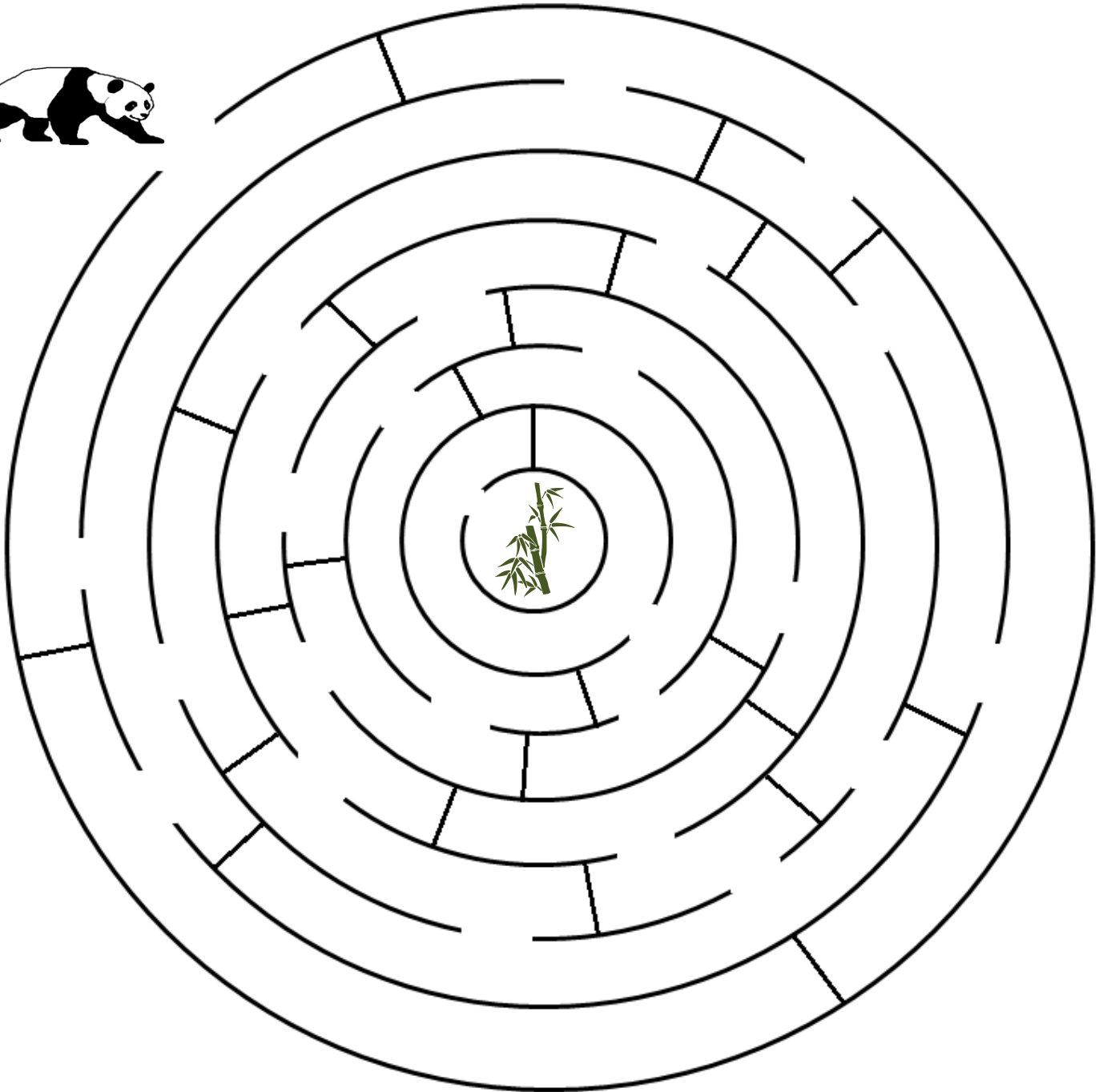6. Wild giant pandas live only in the mountains of this country.
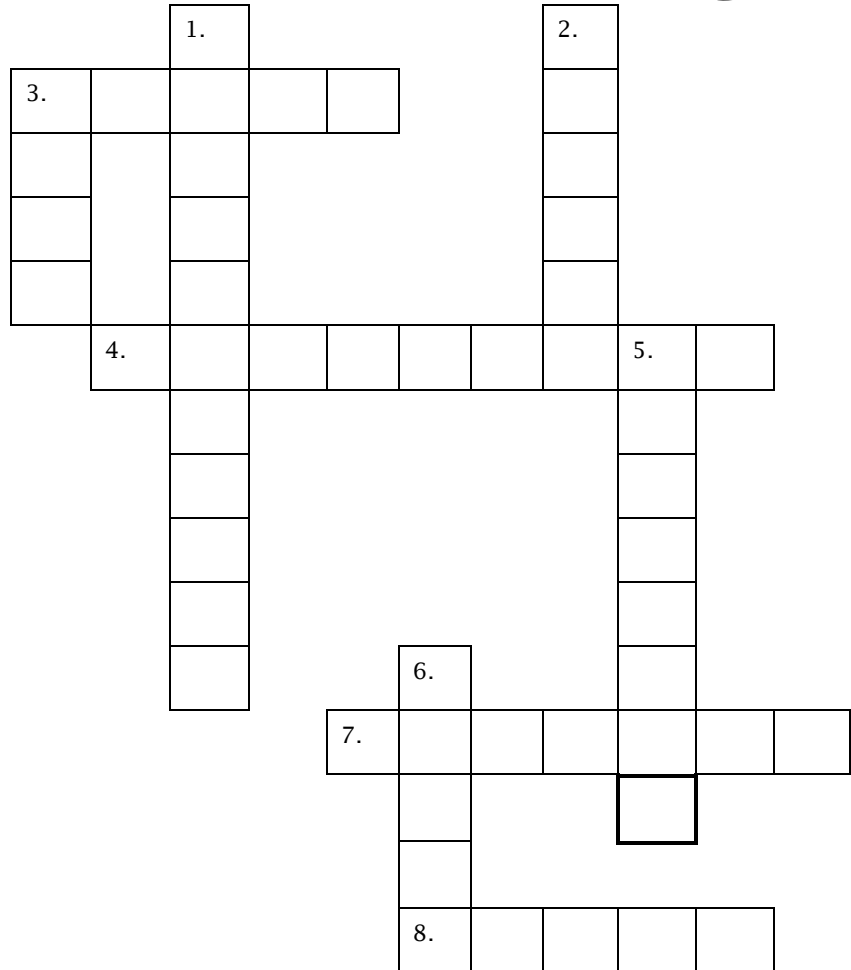
Giant Panda Crossword (ANSWER KEY)

```
            H                     B
      B  L  A  C  K            A
      E     B                  M
      A     I                  B
      R     T                  O
         C  A  R  N  I  V  O  R  E
            T                  A
            L                  C
            O                  C
            S              C   O
            S        S  H  A  A  N  X  I
                     H  I     S
                     N
                     A  P  P  L  E
```

A GIANT Maze

Help the giant panda find its way to its bamboo dinner.

Glossary of Terms

Adaptation–
Any change in the structure or function of an organism that enables it to survive and reproduce successfully in its environment.

Biodiversity–
The variety of animals, plants, and ecosystems.

Carnivore–
An animal that primarily eats other animals.

Community–
Groups of plants and animals that live and interact together in a habitat.

Conservation–
Protecting plants, animals, and their habitats.

Consumer–
An organism that feeds on other organisms.

Decomposer–
An organism that breaks down dead plant and animal matter (decay).

Deforestation–
The destruction of forests, primarily rain forests, through direct human activity (e.g. logging, clearing for agriculture and grazing) and indirect effects of pollution.

Digestive System–
The set of organs that take in food and turn it into usable products that the body needs to survive and stay healthy.

Ecosystem–
A complex system comprised of living organisms and their environment, which interact together as a unit.

Endangered Species–
A species (plant or animal) that is in danger of extinction in the near future.

Environment–
All biotic and abiotic elements that surround, affect, and influence the survival and development of organisms or groups of organisms.

Environmental Impact–
The positive and/or negative effects that human activity or intervention can have on the environment.

Extinction–
The permanent loss of a species worldwide.

Food Web–
A complex network showing the feeding relationships and energy flow between organisms within an ecosystem.

Herbivore–
An animal that eats plants.

Life Cycle–
The order of developmental stages that an organism passes through during its lifetime.

Mammal–
A warm-blooded animal that breathes air, gives birth to live offspring, feeds milk to its young, and has or did have hair/fur at some point in its life.

Omnivore–
An animal that eats both plants and animals.

Organ–
A part of the body made of different tissues that work together to perform specific functions.

Organ System–
A group of organs that work together to perform functions.

Physical Characteristic–
Defining traits or features of an organism.

Producer–
An organism that produces new organic material from inorganic material and sunlight.

Recycle–
Reducing waste by reprocessing used materials into new materials.

Reduce–
Reducing waste by consuming less.

Reuse–
Reducing waste by using disposable materials again or by refurbishing worn or used products for further use.

Species–
A set of organisms that have characteristics in common and that can breed with each other to produce fertile offspring.

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