If My Mom Were a Platypus:
Mammal Babies and Their Mothers

Hands-On Demonstrations
Preparation Information and Directions

- Selected by the **National Science Teachers' Association** as a ***"NSTA Recommends"*** title!
- Featured annually at Family Science Days at the **American Association for the Advancement of Science (AAAS).**
- Endorsed by the **Carnegie Academy for Science Education (CASE)**!
- Featured on Reading is Fundamental, **RIFNet Exchange Television** program: *Nonfiction: Reading to Learn.*
- Selected as a **"Science Through Literature"** title in multiple school systems!
- Chosen for distribution to employees at **National Academy of Sciences.**
- Highlighted by numerous **homeschool** catalogs for its superior content!
- Selected book, **American Society for the Prevention of Cruelty to Animals (ASPCA)**!
- Featured in family education classes, special events programming in **museums** and **zoos** around the country including:
    - Museum of Science, Boston, MA
    - Smithsonian Museum of Natural History, Washington, DC
    - National Zoo, Washington, DC
    - National Children's Museum, Washington, DC
    - Koshland Museum of Science, Washington, DC
    - Los Angeles Zoo, Los Angeles, CA
    - Alaska Imaginarium, Anchorage, AK

If My Mom Were a Platypus:
Mammal Babies and Their Mothers
By Dia L. Michels, Illustrated by Andrew Barthelmes
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Science Through Literature
Hands-On Activities to do with
If My Mom Were a Platypus: Mammal Babies and Their Mothers

Whether the subject is biomes, habitats, reproduction, ecology, nutrition, health, life cycle, anatomy, energy systems, classification, adaptations, family life, or community – educators have embraced ***If My Mom Were a Platypus: Mammal Babies and Their Mothers***. The book (and its accompanying Activity Guide) has lessons and hands-on experiments that will excite and stimulate kids of all ages!

Activity	Key Materials	Science Topic(s)
Baby Bat cups	Sounds and smells in covered paper cups	Sensory perception Infant identification Habitats Life Cycle
Giraffe/Swan Necks	Wooden Spools Beads Pipe Cleaners	Classification Habitats Anatomy Adaptations
Koala odor	Aluminum Foil Paper towels Eucalyptus Oil	Biomes Classification Ecology Permeability Adaptations
Milk delivery	Plush Platypus	Adaptations Life Cycle Family Life Classification
Whale Blubber	Ice Water Crisco	Nutrient Density Habitats Anatomy Energy Systems
Whale "Teeth"	Container for water Beads Sand Combs	Teeth Habitats Nutrient Density
Shrew Heartbeat	Stopwatch	Metabolism Energy Systems
Elephant Feet	Sponges	Habitat Adaptations Weight Management
Elephant Teeth	Bricks Sandpaper	Nutrient Density Anatomy
Lion Tongue	Crayons Sandpaper White paper	Habitats Nutrient Density Adaptations
Biodiversity	Biodiversity Tables	Classification Biomes
Imaginative Mammals	Arts and Crafts supplies Blank LWIS books	Evolution Family Life Adaptations

To learn more about ***If My Mom Were a Platypus: Mammal Babies and Their Mothers*** (ISBN: 1-930775-35-0), visit PlatypusMedia.com or call us at 1-877-PLATYPS (1-877-872-8977). The Activity Guide for the book can be downloaded -- at no charge -- at PlatypusMedia.com.

BABY BAT CUPS ACTIVITY	
Mammal:	Bats
Concepts Addressed:	Sensory Perception Infant Identification Habitats Life Cycle
Materials:	Sounds and Scents in Covered Paper Cups; Bat Erasers make great prizes
Shopping List: **[for class]**	Opaque cups with lids Various distinct sounds (we use popcorn, rice, lentils, noodles, quinoa, etc) Various distinct scents (we use cinnamon, coffee, curry powder, anise, mint, etc.) Black and Red Markers
Sources:	Cups can be purchased at restaurant supply stores Sounds/Scents can be purchased in bulk at grocery stores, food co-ops, health food stores, etc. Bat Erasers can be purchased at Oriental Trading
Activity Guide Reference:	Page 15

Background Information:

Mammal moms have a number of strategies for feeding themselves while they take care of their young. Some mammal moms, primarily the herbivores such as hippos, elephants, etc, keep their babies with them while they feed. Some mammal moms, like the polar bear, fast eat while the cubs are young because it is not safe to leave them and they can't hunt effectively with them. Some mammal moms, the social carnivores like the lions, share the duties, some females will care for the young while others do the hunting. Most mammal moms hide their young while they seek food. Bats are among this group. Hiding your young seems simple enough – but is it?

Mexican free-tailed mother bats leave their babies in a bat nursery (a cave) while they go out at night and hunt mosquitoes. At dawn, with their bellies full, they return to the nursery to feed their young. There are three million bat moms in the nursery. The cave is dark (there is no natural light) and cold. How does she locate her baby (she won't nurse any other child)? By memorizing its smell and the sound of its voice. Try it!

Instructions:

Prepare 5-20 pairs of cups (depending on age and ability of students) as follows:

1) Using a pin, open paper clip or other sharp object, poke holes in the tops of all the cups so you can smell through them.
2) Using a marker, put a red circle on the top of half the cups, a black circle on the tops of the other half.
3) On the bottom of each red cup, write a number starting with 1 and continuing through all the cups (1,2,3,4,5, etc)
4) On the bottom of each black cup, write a number starting with 41 and continue through all the cups (41, 42, 43, 44, etc)
5) Put the cups into pairs, with red #1 paired with black #41, red # 2 paired with black #42, etc.
6) Each pair needs to have a sound and scent added. One scent should go into multiple pairs and one scent should go into multiple pairs – however, only one pair should have the combination of sound/scent. For example, put popcorn in four different pairs of cups. Put mint into four different pairs of cups, but only put popcorn and mint in one pair of cups. You will end up with pairs like this: popcorn/mint (1,41), popcorn/cinnamon (2,42), popcorn/curry (3,43), noodles/mint (4,44), noodles/cinnamon (5,45), noodles/curry (6,46), etc.
7) Put all the red cups together in one area, place all the black cups together in a different area. Ask each participant to select one cup, shake and smell it, and note the number on the bottom, then place it back on the table. They, then, walk to the other set of cups and try to find the one cup with the identical scent and sound. You can verify if they have done this with the numeric codes (1 goes with 41, 2 with 42, etc).

ADAPTABLE NECKS ACTIVITY

Mammals:	Humans, Giraffes and Swans (non-mammal)
Concepts Addressed:	Classification, Habitats, Anatomy, Adaptations
Materials	Wooden Spools, Beads, Pipe Cleaners
Sources:	spools available at www.woodparts.biz; pipe cleaners at www.officemart.com, beads are available at craft stores
Shopping List: for each student:	7 small (.4") spools, 7 larger (.75") spools, 25 (.25") beads, 3 pipe cleaners (approx. 10")
Activity Guide Reference:	Page 12

Background Information:

All mammals have backbones, but even more interesting is the structure of the neck. While birds, amphibians, and reptiles have large variations in this number, in mammals it is fixed at seven. The long neck of the swan is composed of from 22 to 25 cervical vertebrae, while ducks have 16. In contrast, the long necks of the giraffe and camel have seven cervical vertebrae, the same number as the shorter necked humans, mice, and whales. With just a few exceptions (the manatees and the sloths), the number is constant for almost all mammals.

If a giraffe and a mouse have the same number of vertebrae, how are they different? How would the size of the vertebrae help an animal to survive? Let's see…

Instructions:

Tie a knot in a pipe cleaner, string 25 beads on it.
Tie a knot in another pipe cleaner, string 7 small spools on it.
Tie a knot in a third pipe cleaner, string 7 larger spools on it.

Compare the necks for stiffness and flexibility.

Discussion:

Not all necks are the same. A human neck has 7 vertebrae, the same as a giraffe neck. Both giraffes and swans have very long necks, but a giraffe's neck is stiff and a swan's is flexible. Giraffes have only 7 necks bones, but each bone may be up to a foot long. This provides stiffness for an animal that feeds from the tops of trees. A swan has 23-25 small neck bones, this provides for flexibility for an animal that fishes for its food and requires quick, precise movements. How does a human neck compare. Each of our vertebrae are about 1" long, compared to a giraffe vertebrae which is about a foot long.

KOALA ODOR ACTIVITY

Mammal:	Koala
Concepts Addressed:	Biomes, Classification, Ecology, Permeability, Adaptations
Materials:	Aluminum Foil, Paper Towels, Eucalyptus Oil (located at Health food stores)
Shopping List:	Aluminum Foil, Paper Towels, Eucalyptus Oil
Sources:	Eucalyptus Oil can be found at any health food store
Activity Guide Reference:	Page 11

Background Information

Koalas are slow and lazy during the day. In fact, they sleep in trees most of the day; however, at night, they eat eucalyptus leaves. These leaves are also used by humans to make cough drops because they contain menthol. Koalas eat so many eucalyptus leaves that they smell like eucalyptus or cough drops. How does this happen? Do you think it helps or hurts a koalas to smell like menthol?

Instructions:

Have the participant smell the eucalyptus oil from the bottle; show them how to wave the odor towards their nose so they don't accidentally inhale an odor that could be dangerous.
Discuss that even leaves have oil even though they are primarily water and fiber
Have them put a few drops of the oil onto a paper towel? What happens?
Have them put a few drops of the oil onto a piece of foil? What happens?

Discussion:

Discuss permeability (having pores or openings that permit liquids or gases to pass through).
Discuss mucous membranes (A membrane lining all body passages that communicate with the exterior, such as the respiratory, genitourinary, and alimentary tracts, and having cells and associated glands that secrete mucus).
The oil passes through the koala's mucus membrane and is excreted through the skin, thus the smell (humans can witness this by consuming large amounts of garlic).

Students will guess that the smell is bad for the koalas because it will point them out to predators. This is logical, but koalas don't have any natural predators. In fact, the menthol smell helps the koala as it helps to drive away fleas.

MILK DELIVERY

Mammal:	All Mammal Species
Concepts Addressed:	Adaptations, Life Cycle, Family Life, Classification
Materials	Plush Platypus for demonstration
Sources:	Platypus Media
Activity Guide Reference:	Page 10

Back Information:
All mammals have milk glands, but not all mammals necessarily have breasts or nipples as the source of delivering milk to a baby. Likewise, all baby mammals consume milk, but not all baby mammals have lips to suckle. Platypuses are unique in the sense that they have no breasts, no nipples, and no lips. So how does the mother feed her baby?

Instructions:

How does the mom do it?
Using the plush platypus, show that there are no breasts or nipples on the chest. Like a human mother, she has glandular tissue that produces breastmilk. Her glandular tissue lines the whole chest wall. The milk is excreted through the pores in her skin, it simply oozes out of her chest onto her fur, the way that sweat is excreted from us onto our skin.

How does the baby do it?
In order to breastfeed, the baby must make a vacuum seal around the nipple and then suck, pulling the milk out with movements in the lower lip and jaw. A baby platypus has no lips and therefore can't make a vacuum seal so she cannot breastfeed. Instead she uses her bill to push against the chest of the mother with its bill. When the milk excretes out, the baby then licks the milk that was pushed out of the mother's chest off her fur.

Discussion:

The breastmilk production system is sterile, but the breastmilk delivery system is not. Exposure to small amounts of microbes is part of building a strong immune system. The platypus is a good way to observe this.

Extra credit: What other mammals have no lips and therefore need an adaptation for drinking breastmilk (Whales)

WHALE BLUBBER ACTIVITY

Mammal:	Whales
Concepts Addressed	Nutrient Density, Habitats, Anatomy, Energy Systems, Insulation
Materials:	Ice Water, Crisco, Paper Towels
Shopping List:	Bucket or bowl, Crisco, Paper towels (school needs to provide ice) [for class]
Sources:	Grocery store
Activity Guide Reference:	Page 11

Background Information:

The Pacific Gray Whale has the longest known migration of any mammal. They feed in Alaska in the summer, eating 900 pounds of krill a day. When they begin their journey to Mexico in the fall, the mother whales 30 tons and are coated in a 5-10" layer of blubber. The mothers will swim 24 hours a day, travel 10,000 miles, gestate a 2000 pound baby, produce 6 tons of breastmilk and to this all with NO food. The only food they eat, krill, is only in Alaska. For 270 days each year, they live off their blubber. This fat layer not only provides nourishment for them, fat is a concentrated food source, but it also helps keep them warm during the journey. Use solid fat to show the insulation properties of fat.

Instructions:

Put Crisco around one pointer finger of the participant while leaving the other one clean. Dip both fingers (one with and one without Crisco) into ice water and keep them there for about a minute. How do the fingers feel? Do they feel different? The Crisco finger resembles the blubber on a whale. The Crisco keeps the participant's finger warm as the blubber keeps the whale insulated.

WHALE "TEETH" ACTIVITY

Mammal:	Whales
Concepts Addressed	Nutrient Density, Teeth, Habitats
Materials:	Container for water, sand, beads, combs
Shopping List: [for class]	Container for water Sand Small Beads Combs
Sources:	various
Activity Guide Reference:	Page 11

Background Information:

There are two kinds of whales: baleen whales and toothed whales. Toothed whales, like the killer whale, are hunters. Baleen whales, like the Pacific Gray Whale, feeds off the krill, a small shrimp-like crustacean. Baleen is a material, like the cartilage in our noses, that forms a sieve in the whale's mouth. The whale scoops up a mouthful from the bottom of the sea, the sand and water strain out, and the krill are left. Pacific Gray Whales eat 900 pounds of these tiny krill a day to support their 30-ton bodies. .

Instructions:

Fill water about an inch over the sand line in a container. Place some small beads in the sand. The beads represent the krill. Take a comb and sweep up some sand from the container. Shake it slightly. The sand will sieve out; the beads will remain. This is how the baleen works in the whale's mouth.

SHREW HEARTBEAT ACTIVITY

Mammal:	Shrew
Concepts Addressed:	Metabolism, Energy Systems
Materials:	Stopwatch or clock with a second hand
Shopping List:	Stopwatch or clock with a second hand
Sources:	Sporting good stores, Target, Kmart, etc
Activity Guide Reference:	Page 12

Background Information:

Least Shrews are exceptional in the mammal world because they have no ability to store or metabolize fat. In fact, shrews have so little body fat they cannot go more than a few hours without food. Missing a meal is a sure way to a quick death; a good night's sleep could be fatal. The Least Shrew's life is all about getting enough food often enough to survive. A shrew eats 60-100 percent of its body weight within 24 hours – if you weigh 75 pounds, to be like a shrew you would have to eat about 50 really big hamburgers in 24 hours! Just as shrews eat on a large scale, their hearts beat on a similarly grand scale.

Instructions:

Count how many times your heart beats in a minute. This is your pulse. A human child's heart beats about 90 beats per minute, a human adult's heart will be about 70 times each minute. A shrew's heart beats 1200 times per minute!

Discussion:

It is very hard on the body to operate at such high speeds. In fact, the shrew has a very short life span, just 18 months, because, with the system working at such high speed, the body wears out.

ELEPANT FEET ACTIVITY	
Mammal:	Elephant
Concepts Addressed:	Habitat, Adaptations, Weight Management, Anatomy
Materials:	Thick sponges (need to be moist for softness), rubberbands
Shopping List:	One thick sponge with one rubber band wrapped around it
Sources:	Grocery or Hardware stores
Activity Guide Reference:	Page 10

Background Information

Elephants are the largest land mammal feet on the planet, weighing up to five tons! You would think that carrying so much weight around would be hard on the joints. You would also think that moving through the jungle would be a loud endeavor. You would be wrong on both accounts.

Instructions:

Give a student a moistened sponge with a rubber band around the girth. Have them put the sponge on their hand using the rubber band to hold it into place. Using the other hand, with no protective padding, gently hit a flat surface. Hear how much sound it makes and feel how much impact is made. Now, using the padded hand, gently hit the same flat surface. Notice that there is almost complete silence. Also notice that there is very little impact. Soft padded feet help the elephant move over rocks, helps absorb the pressure from their weight off their leg bones, and allows even a herd of elephants to move almost silently through the jungle -- barely leaving footprints!

ELEPHANT TEETH ACTIVITY	
Mammal:	Elephant
Concepts Addressed:	Nutrient Density, Anatomy, Health, Dental Care
Materials:	Bricks, Sandpaper
Shopping List:	Bricks, Sandpaper
Sources:	readily available
Activity Guide Reference:	Page 10

Background Information:

The majority of mammals are herbivores, eating grasses, leaves and plants. These foods are most fiber and water and are low in nutrients. In order to get the nutrients they need to survive, most herbivores have to eat up to 20 hours a day (and even then, some resort to vomiting food and re-eating it or re-eating their stools to extract any nutrients missed the first time!). Eating can be very hard on the teeth. Herbivores largely grind their food, mammals that eat seeds and nuts need to crack them open. Either way, the teeth take a beating!

Instructions:

Elephants spend 16 hours each day looking for food. While eating, they grind their teeth. Using the sandpaper, rub the brick until you see dust in the air. This is what happens to the elephants teeth with each meal.

Discussion:

After 10 years of constant grinding and wearing away, the elephants will grind their teeth until there is nothing less. Fortunately, this triggers a new set of teeth to erupt. Their full set of teeth will grow back six times, but after that the sixth set, no more will grow in. What will happen when the elephants no longer have teeth? How are teeth connected to survival? How many sets of teeth do humans have? How are teeth important to carnivores? From a dental point of view, would you rather been an herbivore, an omnivore, or a carnivore?

LION TONGUE ACTIVITY

Mammal:	Lion
Concepts Addressed:	Habitats, Nutrient Density, Adaptations
Materials:	Paper with Wildebeest design, crayons, sandpaper
Shopping List:	crayons, sandpaper
Sources:	readily available
Activity Guide Reference:	Page 11

Background Information:

Lions have amazing social structure. The females do all the hunting and share tasks and motherly duties within the tribe while the males protect them as a whole. They hunt antelope, wildebeest, and buffalo, which are eaten by the whole tribe. Hunting is serious work, with a low success rate, requiring a lot of risk. When an animal is felled, it is essential to gain all the nutrients possible from the animal. Lions have an adaptation in their tongues that allow them to leave no waste behind. They have tongues like sandpaper that efficiently scrape all the flesh off the bones.

Instructions:

Using a dark-colored crayon, color in a section of the wildebeest. Take a piece of sandpaper and rub it on the crayon. Look at the sandpaper. The crayon has lifted off the paper and attached itself to the sandpaper. This is how a lion's tongue works. The scratchy tongue grasps the flesh off the bone and peels it off.

BIODIVERSITY ACTIVITY	
Mammal:	Assorted
Concepts Addressed:	Classification, Biomes, Diversity
Materials:	Biodiversity Tables (included)
Sources:	Biodiversity Tables
Shopping List:	None

Background Information:

There are more than 5,100 species of mammals. All have milk glands, have hair or fur, have a backbone, are warm-blooded. All mammal mothers feed, protect, and teach their young. And all mammal babies need to learn how to feed and protect themselves, but that's where the similarity ends. Humans have classified animals in order to group them by characteristics. All mammals are in the kingdom *Animalia* and the Phylum *Chordata* (having a backbone). Our Class in *Mammalia*. Within that class, there is tremendous diversity. See if you can fill out the biodiversity table supplied to get a glimpse of how much variety there is in the world of mammals!

IMAGINATIVE MAMMALS ACTIVITY	
Mammals:	Species not yet discovered….
Concepts Addressed:	Evolution, Family Life, Adaptations
Materials:	assorted Arts and Crafts Supplies
Shopping List:	assorted Arts and Crafts Supplies
Sources:	various

Background Information:

Mammals come in all different shapes and sizes, and each has its own adaptation methods to survive. Using arts and crafts materials, design and create a mammal. Decide what its habitat is, how it lives and how its adaptations allow it to survive. Then, using a first-person lifecycle story, in the style of the If My Mom Were a Platypus, describe how the animal lives and what it needs to survive.