

Biomechanics

Activity Summary:

In groups or partners, the students will participate in a building activity to create a physical model of a limb from one of the animals on the medicine wheel, Deer, Coyote, Bear, and Eagle. This activity will allow the students to demonstrate the movement and structure of the bones of these animals. Students will then partake in a presentation development session to create oral presentations to teach the other students of what they have learned. Presentations will then be presented during another session to the rest of the students. (GPP30)

This activity has an accompanying slideshow presentation and information sheet as a teaching aid for instructors, called Biomechanics Activity Presentation and Biomechanics Information Sheet.

Description of activity:

- Critical Thinking and Planning
- Hands-On and Construction
- Oral and Peer Presented

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Delivery Environment	Activity Duration	Intended Audience
<ul style="list-style-type: none">● In Person● Gull Lake● Groups or Partners	6 hours	Grades 9-10 (Ages 13-18)

Activity Goals:

Learning Goals

Following this activity, participants will:

- Know the biomechanics of a variety of animals from the medicine wheel, predator, prey, and aviation.
- Know how to create a model of various types of animal's legs/wings from the medicine wheel, predator, prey, and aviation.
- Know how the biomechanics of the animals of the medicine determine their roles in society and the environment.

Success Criteria

Following this activity, participants will have:

- Expressed their knowledge of animal biomechanics for the animals of the medicine wheel through the creation of a leg/wing model.
- Shared their learning with their peers through a verbal presentation and demonstration of their model.
- Demonstrated critical thinking and creativity with the use of the materials provided and the materials they have gathered.

Curriculum Connections:

- **Personal Knowledge and Management Skills**
 - Personal Knowledge;
 - Explain how a variety of factors (e.g., culture, family background, personal experiences, the media) have influenced their personal motivation and skills related to leadership and peer support roles.
 - Leadership Qualities;

- Research and identify the leadership qualities and styles of a diverse range of people, including Aboriginal individuals, in leadership and support roles (e.g., in sports, politics, community, and/or school).
- **Interpersonal Knowledge and Skills**
 - Interpersonal Relations;
 - Describe the elements of effective interpersonal relations (e.g., respect for differences, commitment to equity and fairness, flexibility, honesty, integrity) and demonstrate their use in selected leadership and peer support roles in school or in the community.
 - Describe a conflict-resolution model and demonstrate its use in a variety of situations to reduce conflict and reach mutually agreeable solutions.
- Exploration of Opportunities
 - Accessing Options;
 - Analyze selected leadership or peer support roles (e.g., tutor, student host, team captain, student council member) in terms of responsibilities of the role, skills required, time commitments, and benefits and challenges.

Logistics (Timing, Group Size, Materials):

Section Title	Time	Group Size	Materials
Opening: Lesson	5 minutes	Whole Class	Facilitators <ul style="list-style-type: none"> ● Pre-made model ● Teaching aid presentation Group <ul style="list-style-type: none"> ● Journals

Section Title	Time	Group Size	Materials
			<ul style="list-style-type: none"> ● Pen or Pencil
<p>Section 1: Collect Materials</p>	<p>10 minutes</p>	<p>Whole Class</p>	<p>Group</p> <ul style="list-style-type: none"> ● Scissors
<p>Section 2: Creation of Models</p>	<p>1 hour 45 minutes</p>	<p>Small Groups, Pairs, or Individual</p>	<p>Facilitators</p> <ul style="list-style-type: none"> ● Printed Pictures of Bone Structure ● Extension Cord ● Information Sheets <p>Group</p> <ul style="list-style-type: none"> ● Sicks (Collected) ● Elastic Bands ● String ● Scissors ● Hot Glue Guns and Additional Glue Sticks ● Wire and Wire Cutters ● Pencil and Paper ● Sand Paper ● Painters Tape ● Awl or Hobby Drill Bits ● Cedar (For Eagle)
<p>Section 3: Beyond STEM</p>	<p>2 hour</p>	<p>Groups</p>	<p>Facilitators</p> <ul style="list-style-type: none"> ● Teaching Aid Presentation <p>Group</p> <ul style="list-style-type: none"> ● Wing/Leg Model ● Information Sheets

Section Title	Time	Group Size	Materials
Section 4: Share and Teaching	1 hours 30 minutes	Whole Class Learning From Each Group	Group <ul style="list-style-type: none"> • Finished Models • Information
Reflection & Debrief	30 minutes	Whole Class	Facilitators <ul style="list-style-type: none"> • Group <ul style="list-style-type: none"> • Journals • Pen or Pencil

Risk Assessment:

- **Burns Hazard**
 - Hot guns should be used with care to avoid burns and have a first aid kit on hand. Provided protective gloves should be worn at all times by those using the glue guns.
- **Cutting/Poking Hazard**
 - Sharp and pointy tools and materials are involved in this activity and should be used with care to ensure no cut or prick injuries occur. No cutting of any kind should be done towards the body, students observed doing so should be informed of their error to prevent injury.
- **Tripping Hazard**
 - Students should be cautious when walking outside to collect materials for their models, and should remain in sight or with an instructor at all times.

Activity Procedure :

To Do in Advance

GENERAL

- Ensure a projector is available for the teaching aid presentation.

- All non-natural materials should be obtained in advance and provided to the students.
- Time should be allotted before the start of this activity to allow students an opportunity to collect the sticks/twigs and other natural materials they need for their biomechanical models.
 - Extra sticks should be collected in advance by the instructor and provided to the students in case of rainy weather or need for additional sticks due to breakage.

SECTION 1: Collect Materials

- An area for the collection of natural materials should be predetermined and examined for potential hazards to the students.
 - If students wish to walk further than the designated area for their materials, then an additional instructor should accompany them at all times.

SECTION 2: Creation of Model

- Information sheets should be printed off in advance to ensure each student, or at least each group, has a copy.
 - These information sheets will continue in use during the Beyond STEM portion of this activity.

Reflection and Debrief

- Prepare reflection questions and attach them to the corresponding slide on the teaching aid presentation.

Opening: Lesson (5 Minutes)

During this portion of the activity, the students will sit for a short introduction. This introduction, like all the sessions of this activity, will be guided by a presentation with prompt slides, reflection questions, and photos. This opening lesson will be the

opportunity for the instructors to demonstrate a completed version of the biomechanics models, or multiples if there are enough.

1. This is the instructor's opportunity to answer any preliminary questions the students may have with regards to the activity before they begin the collection and building process.

Section 1: Collect Materials (10 Minutes)

Students will be broken up into groups of 3 to 4 and given an opportunity to go outside of the teaching space to collect natural materials that they believe they would be able to use in the creation of a limb bone structure model. These materials should not be collected from living plants, and should be collected from the ground or forest floor.

1. Instructors should have sight of all the students at all times to ensure safety when collecting their materials.
 - a. Students should not be allowed to wander too far from the rest of the group and should not be allowed to collect materials from the edge of a river, lake, or other body of water without the presence of lifeguards.

Section 2: Creation of Model (1 Hour 45 Minutes)

Students will be given time and non-natural materials, as well as the natural materials they have collected, to create a model of the bone structure of one of the various animals of the medicine wheel. These animals include the Deer, Coyote, Bear, and Eagle. During this portion of the activity, an instructor will be situated with each group, with a copy of the additional information sheets, monitoring the safe use of the tools, and sharing the information on the sheets with the students in that group.

1. Information sheets presented to the groups at this time will be the information that pertains to the animal in which they are creating a limb model of.
 - a. These facts are not the main focus of the instructor sitting with the students, the proper use of scissors, hot glue guns, and wire cutters should be the main focus.

- b.** The facts read to the students during this time should also be the first side, and generally knowledge information, saving the Indigenous knowledges and stories of each animal for the beyond stem portion of this activity.
- 2.** Creation of these models should be mostly up to the students, allowing them to express critical thinking and problem solving into the creation of these models. Instructors can be asked for their insight into a portion of the build, but the overall creation should be completely up to the students in the group.
- 3.** If students are unable to complete their model, time can be borrowed from the following session as it should not take a full 2 hours, but has time for adjustments.

Section 3: Beyond STEM (2 Hours)

After the students have completed their models, they will be given time to prepare an oral presentation to share the information they have learned, from the information sheets and from the creation of their models, with the other groups and students. For this portion of the activity, with a large group of students, the students can be brought back into 4 groups, the animals in which they have created a model for, instead of having multiple groups for the same animal.

- 1.** Students should be collaborating with the others in their group to create a collaborative oral presentation. This presentation should inform the other students of the general information of the animal in question, Indigenous stories, and importance of the animal, as well as the information the students have learned from the creation of the model.
 - a.** Information about the students oral presentations should be recorded in their journals as the presentation itself will occur in the following session.

Section 4: Sharing and Teaching (1 Hour 30 Minutes)

The sharing and teaching section of this activity is where the students will then share their information and models prepared in the previous section of this activity. This sharing will be conducted as a sharing circle type presentation to remove the weight of

this portion of the activity. Every student should be and is encouraged to partake in this portion of the activity, even if each student only shares 1 fact each about the animal.

Reflection & Debrief (30 Minutes)

During this portion of the activity students will be asked to reflect on the entire process of the activity. Students will be asked what they enjoyed most about the activity, what they learned, and which animal interested them more. What would the students have done differently if they were to create their models again. Additional reflection questions can be added to provide a more in-depth reflection.

1. Reflection questions will be located and be edited from the accompanying slideshow to this activity.

Delivery Adaptations

How might you adapt the time, space, materials, group sizes, or instructions to make this activity more approachable or more challenging? **Modifications** are ways to make the activity more accessible, **extensions** are ways to make the activity last longer or more challenging.

Modifications

SECTION 2: Creation of Model

- If this activity cannot be completed at Gull Lake, kits for this activity can be created in advance to allow the students to complete this activity from campus if necessary.

SECTION 3: Beyond STEM

- Presentations created by the students for the sharing and teaching portion of this activity can be created with any means the students find necessary. Slideshow presentations can be created as well as drawings or what even means of sharing the students' wish.

Extensions

SECTION 2: Creation of Model

- Students can learn about budgeting by give them a money value in which case they will need to spend to buy the resources they need to create their models. The goal should be to try and maintain within their budget and use their resources wisely.
 - Students will start with a total of \$50. Sticks could be \$5 each, tape being \$2/ 4", string \$3/ 4", etc.

SECTION 3: Beyond STEM

- Have students create their own activity based on the knowledge they have learned about animal biomechanics. This may take the place of the presentation and may involve the students designing a game around their animal and the information they have learned.
- Allow the student more time to create a more in-depth presentation with access to the internet to gain more knowledge on the animal in question and additional time to create a presentation for their peers that reflects this information.

Rationale

This activity is meaningful and impactful to a student's learning as it allows them to use their creativity to create models based on knowledge they collected about an animal's bone structure. It gives them the chance to use their leadership and teamwork skills as they work together and help their group members to make a working limb of an animal.

References & Gratitude:

<https://www.npr.org/sections/goatsandsoda/2021/11/10/1054224204/how-sars-cov-2-in-american-deer-could-alter-the-course-of-the-global-pandemic>

<https://encrypted-tbn3.gstatic.com/licensed-image?q=tbn:ANd9GcQL4-QTou2PdM-JLFRcn7EjaeP5qE2emzmmRahSkvhCv5Do1KF--UYmtULA1HAsYrtQ79kMnbynS3cRw2w>

<https://www.britannica.com/animal/coyote-mammal>

<https://www.eaglewingtours.com/articles/nine-bald-eagle-facts-that-may-surprise-you/>

<https://www.nps.gov/places/000/bald-eagle.htm>

<https://www.pinterest.ca/pin/129760032984188068/>

Instructor feedback:

Student Feedback:

Appendix:







