Horseshoe Crabs

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| **Stage 1 – Desired Results** |
| TransferStudents will transfer the process of this lesson for a better understanding of the world around them. They will look to see why things happen as they do. |
| **Content Standard(s): 4th Grade**Elementary Science Core Curriculum- K-4Standard 1-Analysis, Inquiry and DesignMath-* Key Idea 1-abstract and symbolic representation are used to communicate mathematically
* Key Idea 2- use deductive and inductive reasoning to reach mathematical conclusion
* Key Idea 3- critical thinking

Science-* Key Idea 1- scientific inquiry
* Key Idea 2- testing of proposed explanations
* Key Idea 3- interpret organized observations

Standard 4- Science – Living Environment* Key Idea 1- living things are both similar to and different from each other and from nonliving things
* Key Idea 2- genetic information is inherited
* Key Idea 3 – individual organisms and species change over time
* Key Idea 5- organisms maintain a dynamic equilibrium that sustains life

Standard 6 – Interconnectedness- common themes* Key Idea 1- systems thinking
* Key Idea 2 –models

Standard 7 – Interdisciplinary problem solving* Key Idea 1 – connections
* Key Idea 2 – strategies

See Next Generation Science site for further information at [www.nextgenscience.org/search-standards-dci](http://www.nextgenscience.org/search-standards-dci)  |
| **Understanding (s)/goals**Students will understand that:* The form of a Horseshoe Crab is predicated upon the function of its parts.
* A Horseshoe Crab’s lifecycle and anatomy are inextricably linked
* Certain structures remain the same but certain features vary according to the individual
 | **Essential Question(s):*** How are Horseshoe Crabs well suited to live in their environment?
* How does a Horseshoe Crab interact with its environment and other members of its species during spawning season?
* How do Horseshoe Crabs depend on each other for survival?
* How do the biotic communities that live on a Horseshoe Crab’s exoskeleton rely on the species for survival?
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| **Students will be able to**:* Identify the parts of a Horseshoe Crab’s external anatomy
* Design and Build a model of a Horseshoe Crab’s exoskeleton using K’Nex (building tool) and construction paper
* Observe and interact with species in its natural habitat
* Record relevant anatomical data for the species
* Create circle graphs and bar graphs representing the data; interpret the graphs
* Compare their previously constructed Horseshoe Crab models to the anatomical data collected in the field
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| **Stage 2 – Assessment Evidence** |
| **Performance Task(s):*** Students will create Horseshoe Crab(HC) models containing a prosoma, an opisthosoma, a moveable telson, 2 compound eyes, and will be able to differentiate male or female and know if it is a host for a biotic community
* Students will collect data for HC external anatomy, measuring & observing sex of crab, assessing fouling score, and inferring the age of the animal
 | * They will also make connections between a HC’s anatomy and life cycle through question and answer during and after data collection
* All graphs will have a title and labels wherever appropriate i.e.; x & y axis
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| **Stage 3 – Learning Plan** |
| **Learning Activities:****Pre-trip lesson*** Briefly review the external anatomy of the Horseshoe Crab (www.horseshoecrab.org)
* Explain to the students that they will be designing and building a model of a Horseshoe Crab’s exoskeleton using tissue and construction paper
* Inform the students that their model must include a prosoma, an opisthosoma, a moveable telson, and 2 compound eyes, will be able to be differentiated as male or female, and may or may not host a biotic community.
* Also, they must have teacher approval before moving onto adding construction paper to their model
* Once the construction paper is added, the students must label all of the required anatomical features.

**Trip lesson*** At the site distribute pencils, clipboards, and data sheets
* Each student has a turn interacting with a Horseshoe Crab and recording the data;
* Turn & Talk – students respond to questions: what did you notice about female and male Horseshoe Crab interaction? When the Horseshoe Crab was placed with its dorsal side on the san, how did its telson move? How did the Horseshoe Crab respond to your handling it? How did you respond to the Horseshoe Crab?

**Post trip lesson*** From their fieldwork data sheets, have the children create circle and bar graphs for each of the recorded categories, i.e.; sex, age, fouling score, and prosomal width.
* Have the children repeat their fieldwork data collection on their model Horseshoe Crabs.
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