

Quetzalcoatlus: Did it fly?

Lesson Plan

Grade
7-8

NGSS Standards
MS-LS4-1, MS-LS4-2

21st Century Skills
Critical thinking, problem
solving

Materials
Access to D&D Virtual
Reality exhibit, provided
links, lesson handout

Estimated time
1-2 hours

Difficulty
Medium

Vocabulary
deltopectoral crest,
humerus, membrane,
pneumatized,
Quetzalcoatlus,
trabeculae

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Objective

Learn the arguments that surround the flying ability of Quetzalcoatlus, a large pterosaur from the Late Cretaceous. This lesson will focus on concepts of anatomy, adaptations and critical thinking.

Activity

Students access the Darwin and Dinosaurs Virtual Reality Exhibit. They will also use provided links to access scientific articles and materials. Based on these resources they will answer questions and demonstrate an ability to weigh the scientific merit of the ideas and options presented.

The teacher will provide the Student Worksheet and a map of the exhibit. Students can visit the virtual exhibit as often as needed and have the option to work individually or as teams, as determined by the instructor.

Assessment

Ten questions are included with identical point values. The answers to all the questions can be found in the exhibit. In addition, students will draw a scale comparison between the Quetzalcoatlus and a human and read several short research articles. Through these activities students will learn the main concepts of the lesson.

Class Discussion

After the Assessment is complete, a class discussion allows students to share their thoughts on how whether or not Quetzalcoatlus could fly. Students discuss the various pros and cons and share their ideas.

Students realize at the end that many scientific questions are undecided and open to debate, and can only be answered with more research and/or discoveries.

Lesson plan based on Darwin & Dinosaurs Virutal Reality Exhibit
More lesson plans at darwindinosaurs.com

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Lesson Structure

Students visit the Darwin & Dinosaurs Virtual Reality Exhibit, paying special attention to the Quetzalcoatlus (a large pterosaur in the exhibit). Next, students read the three short articles listed on the Student Worksheet. Answers to the questions in the Assessment can be found in the exhibit or the articles.

The Student Worksheet is two pages, designed to be printed both sides of a single sheet of paper and handed in and marked at the end of the lesson. On the front, students record their name/class and answer ten questions. On the reverse they draw a Quetzalcoatlus and a human to scale and list the main reasons scientists think it could or could not fly (this area of the Student Worksheet can also be scored at the discretion of the teacher).

Class Discussion

The class discussion begins with a vote as to whether or not the students believe the Quetzalcoatlus could fly. The teacher then makes two lists on the board, Could Fly and Couldn't Fly, and students provide facts and/or evidence for each based on their research (supplemented by the teacher if need be). The main points are:

Could Fly	Couldn't Fly
<p>Well-developed deltopectoral crest on the humerus (indicating strong muscle attachment for flight muscles)</p> <p>Pneumatized bones (full of air spaces)</p> <p>Similar body structure to pterosaurs whose flight abilities are not questioned.</p> <p>Need to fly soon after hatching to escape predators.</p>	<p>Too heavy. Pterosaur bones heavier than previously thought, Quetzalcoatlus weight underestimated.</p> <p>There are large flightless birds. Ostriches grow to 10 ft tall and 350 lbs. They have wings but cannot fly.</p> <p>Does not appear strong enough to take off from the ground.</p>

The class discussion ends with another vote to see if the discussion changed anyone's mind. If they did, it's a great chance to discuss why, and how it reflects the nature of science—theories change as new discoveries are made and new ideas emerge.

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Additional Resources

[A more detailed argument for flight in Quetzalcoatlus](#)

markwitton-com.blogspot.com/2018/05/why-we-think-giant-pterosaurs-could-fly.html

[Digital Quetzalcoatlus vertebra](#)

digimorph.org/specimens/Quetzalcoatlus_northropi/

[Wikipedia article on Quetzalcoatlus, with good anatomical discussion and details](#)

en.wikipedia.org/wiki/Quetzalcoatlus

[Quetzalcoatlus not strong enough to take off](#)

blogs.bu.edu/bioaerial2012/2012/11/24/quetzalcoatlus-largest-flying-animal-or-not

[Pronunciation guide](#)

youtube.com/watch?v=ANxYWjepMGs

[Quetzalcoatlus Images](#)

dinosaurpictures.org/Quetzalcoatlus-pictures

Virtual Exhibit

[Darwin & Dinosaurs Virtual Reality Exhibit](#)

my.matterport.com/show/?m=fv3NZ9XP6Zd

Password: Education001

Instructions for using the touchscreens in the VR exhibit

When “walking around” in the 3D model click on a touchscreen. A popup will display “Click here for more information.” Click on this link. This will open a new tab and download the Intuiface Player which is needed to run the experience. (You only have to do this once. If you click on another experience later you can skip this step). After Intuiface is connected, the experience will download automatically. You can exit anytime (back to the browser) with the esc key. The 3D model will still be open in the original tab.

The touchscreen experiences **work only on a Windows, iPad or Android device**. Not on a Mac.

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Teacher Answer Key

No.	Question	Answer	Pts.
1	What was the wingspan of Quetzalcoatlus?	Roughly 10 meters (33 feet).	2
2	Where did Quetzalcoatlus get its name from?	The Mesoamerican deity Quetzalcoatl (means “feathered serpent”)	2
3	What did birds evolve from?	Dromaeosaurid dinosaurs.	2
4	How many times has flight evolved in the animal kingdom?	Four.	2
5	What did pterosaurs have instead of feathered wings?	A membrane that stretched from their elongated fourth finger to their legs.	2
6	What living animal have predatory giant pterosaurs been compared to?	Storks.	2
7	What are the connective bone structures within pterosaur bones called?	Trabeculae.	2
8	What function do trabeculae serve?	They strengthen the fragile bones of pterosaurs	2
9	How did Quetzalcoatlus manage to weigh so little for its size?	Having a tiny torso, hollow bones and interior air sacs.	2
10	According to Dr. Habib, how many limbs did pterosaurs use to take off?	Four.	2

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NAME

CLASS

URL my.matterport.com/show/?m=fv3NZ9XP6ZdPASSWORD **Education001**

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Draw yourself next to the Quetzalcoatlus (to scale).

20 ft	
15 ft	
10 ft	
5 ft	

Reasons to think it could fly.

- 1.
- 2.
- 3.

Reasons to think it could not fly.

- 1.
- 2.
- 3.

Read the following short articles.

Mark down the main reasons that scientists think Quetzalcoatlus could fly or not fly. Which do you think is correct? Be prepared to discuss in class.

[Monster pterosaurs could fly with freakishly long necks because of some really weird bones.](http://syfy.com/syfywire/monster-pterosaurs-could-fly-with-freakishly-long-necks)
syfy.com/syfywire/monster-pterosaurs-could-fly-with-freakishly-long-necks

[Pterosaurs should have been too big to fly - so how did they manage it?](http://theconversation.com/pterosaurs-should-have-been-too-big-to-fly-so-how-did-they-manage-it-60892)
theconversation.com/pterosaurs-should-have-been-too-big-to-fly-so-how-did-they-manage-it-60892

[These giant dinosaurs are changing what we know about flight](http://inverse.com/article/33199-biggest-flying-animal-ever-pterosaur-azhdarchid-quetzalcoatlus)
inverse.com/article/33199-biggest-flying-animal-ever-pterosaur-azhdarchid-quetzalcoatlus