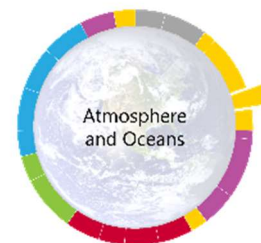


# Atmosphere and Oceans Learning Segment Table (approximately 5 to 6 traditional class days)



The model:

1. The Earth was formed from space rocks, so the water for the oceans and gases for the atmosphere must have come from space rocks.
2. There's plenty of water in space rocks to have filled the Earth's oceans.
3. Volcanoes released and continue to release water vapor and gases from the interior of the Earth.
4. Gases released from volcanoes thus created the atmosphere too.
5. The water vapor (a gas) condensed and formed the oceans.

Seg	Model Move	Est Time (min)	Overview	What did we figure out?	Model Ideas Generated
1	P→Q	15	We remind ourselves of our observations of Earth in order to return to other questions about how the Earth got to be the unique planet that it is. In doing so, we develop or remind ourselves of three key questions (two of which we'll take up).	We've essentially returned to the leftover pieces of our initial Driving Question. We'd like to know first where Earth's oceans and atmosphere came from.	
2	Q→M	30	We offer some initial ideas about the formation of Earth's oceans and atmosphere.	We've explored some initial ideas but we've also recognized that we need more information.	The Earth was formed from space rocks, so the water for the oceans and gases for the atmosphere must have come from space rocks.
3	P→M	55-110	We engage in a lab and then a series of readings in order to further explore how oceans and atmosphere formed.	We've learned that yes, you can get enough water from space rocks to make an ocean!	There's plenty of water in space rocks to have filled the Earth's oceans.
4	Q→M	55	We are now wondering how water might have made it to the surface of the Earth to form the oceans. By engaging in a reading, we also come to realize that volcanic outgassing might also explain the origin of our atmosphere!	We've generated some ideas about the central role of volcanism in releasing the gases that make up our oceans and atmosphere, and we have explicitly discussed condensation. We are now ready to re-group around our Driving Questions and finalize our model.	Volcanoes released and continue to release water vapor and gases from the interior of the Earth. Gases released from volcanoes thus created the atmosphere too.
5	M	30	We work to generate and	By problematizing the lab, we	If not before now, we

			finalize our model for the formation of Earth's oceans and atmosphere.	recognized that we might not yet understand what happens during an impact. We decide we have questions about both matter and energy. What happens with each when a space rock hits the Earth?	develop a last idea: The water vapor (a gas) condensed and formed the oceans.
6	M→Q	20	We finish the unit by formally applying our model back to our original question and write a letter to a relative or friend explaining the origins of Earth.	We've figured out that we have a pretty good sense of how three of the four "spheres" of Earth were formed.	
A	M	55+	<p><b>Optional.</b></p> <p><b>Human Impacts-Water</b></p> <p>We delve into the importance of water in human civilization, leveraging what we know about the water cycle and relating that to problems around drinking water and agriculture.</p>	We've tied our understanding of our model to the water cycle and the water cycle to conservation issues. This has helped us to connect our learning back to bigger questions about human impacts.	Though not directly part of the model explaining formation of the atmosphere and oceans, the water cycle contains aspects of the model (volcanic outgassing and condensation/precipitation). More importantly, the ideas explored here can be leveraged as part of a series of ideas that address our year-long driving question about human impacts.