

TIMELINE CLOTHESLINE*

Polar Seas (Grade 8)

Lesson Overview

Students will stretch the Timeline Clothesline across the classroom. Then they will break up into groups, or as a class, be given different cards that have an event written on one side and an approximate date on the other. They will be asked to place their event on the timeline. This will be repeated 4 times, representing the Earth's history.

Lesson Rationale

The idea of climate change occurs over enormous time scales that are often difficult to conceptualize. This lesson addresses the vast scope of climate study and will help students come to the realization that the Earth has a natural climate variability.

Teacher's Notes

Timeline Clothesline could be completed in as little as 20 minutes but there is approximately 1 hour minimum preparation time to become familiar with the materials. Also, be sure to have a lot of space to stretch the rope "timeline" out—moving desks, or performing the lesson in a larger room or outdoors is a good alternative.

*This lesson is from the *Climate Change Backpack*, published by the New England Science Center Collaborative.

Key Concept:
Students gain a perspective of how the Earth has evolved since its beginning including: (1) How and when our atmosphere formed. (2) How our atmosphere changed over time due to interconnected geological, biological, hydrologic, and atmospheric processes

Time Required:

1 class period

My Notes

Subject Area	Interdisciplinary Connection	Resources	Going Further	NJCCCS
Science	<ul style="list-style-type: none"> Modeling a timeline Earth science Photosynthesis Environmental Change 	Timeline cards Clothes line 15 clothes pins(spring type)		Standard 5.1 (Scientific Process) B.2, B.3 Standard 5.2 (Science and Society) A.1, A.3, B.1, B.2 Standard 5.3 (Mathematical Application) A.1, C.1 Standard 5.5(Life Science) A.1, B.2 Standard 5.6(Chemistry) A.1 Standard 5.8(Earth Science) B.1, C.1 Standard 5.10 (Environmental Studies) B.1
Language Arts Literacy	<ul style="list-style-type: none"> Fact gathering Group discussion 		Debate: Are humans really to blame for the recent climate change or is this another stage in a larger Earth cycle?	Standard 3.1(Reading) A.1, F.1, F.2 Standard 3.3(Speaking) A.2, A.4, A.7, B.4, D.6, D.8 Standard 3.4(Listening) A.2
Mathematics	Time continuum Scale in time(1/100th)			Standard 4.1 (Numbers & Numerical Operations) A.2, A.3, C.2 Standard 4.4(Data Analysis) C.3 Standard 4.5 (Mathematic Process) B.1, B.2, C.3, C.4, D.2, E.1

Subject Area	Interdisciplinary Connection	Resources	Going Further	NJCCCS
Social Studies	<ul style="list-style-type: none"> World (Earth) History Governments established Early Humans Hunting & Gathering 		Group discussion Debate(See above LAL)	Standard 6.1 (Social Studies Skills) A.1, A.2, A.4, A.5, A.9, A.11 Standard 6.2(Civics) E.8 Standard 6.3(World History) A.1, A.2, B.5, B.10, B.11 Standard 6.5(Economics) B.1, B.3 Standard 6.6(Geography) B.2, C.3, C.4, C.5, E.1, E.2
Visual Arts	Visual representation of different eras via different colored information cards			
Technology			Use online resources to follow up on any interesting information points from clothesline	
World Language				
Career Education & Consumer, Family & Life Skills	<ul style="list-style-type: none"> Group discussion Teamwork Leadership skills 			Standard 9.2(Consumer, Family & Life Skills) A.1, C.1, C.2, C.3, C.4, C.5, C.6
Physical Education	<ul style="list-style-type: none"> Group discussion Teamwork Leadership skills 		Physically demonstrate the idea of 1/100th using the playground (measure out 100ft on the ground and compare it to 1 foot) Create a game that demonstrates the idea of photosynthesis	Standard 2.2 (Integrated Skills) E.1

You can download all the presenter guides or order the backpack.

Activity 8

The Timeline Clothesline

Overview

This activity gives your audience the opportunity to contemplate the enormous time scales involved in the study of climate, and to think about the major events in the distant past that created the systems that today govern climate, weather and temperature.

This activity draws on four timelines. For each one, you will need a set of cards, a rope and some clothespins, all of which you will find in the Backpack. The cards are to be hung on the rope, using the clothespins. The first timeline uses 13 blue cards, the second five green cards, the third six yellow cards and the fourth six red ones. The name of an event or process has been written on the front and back of each of the cards. The cards have then been folded in two. Inscribed inside each card is the age of the event or process that is written on the outside.

Note that most of these numbers are approximations, representing the midpoint within a range. The goal of this activity is to understand the sequence of events, not precisely when each one happened.

When talking about climate change, it is important to convey the concept of geologic time, and to discuss how the Earth's climate system has changed without human influence. Climate responds to physical and chemical changes in the atmosphere, changes that can vary over millions of years. By looking at the magnitude of the changes that have taken place over Earth's long history, we can get a sense of the Earth's natural climate variability.

Central Questions/Goals

1. Gain a perspective of how the Earth has evolved since its beginning, including
 - a) How and when our atmosphere formed.
 - b) How our atmosphere changed over time due to interconnected geological, biological, hydrologic, and atmospheric processes.

DURATION:

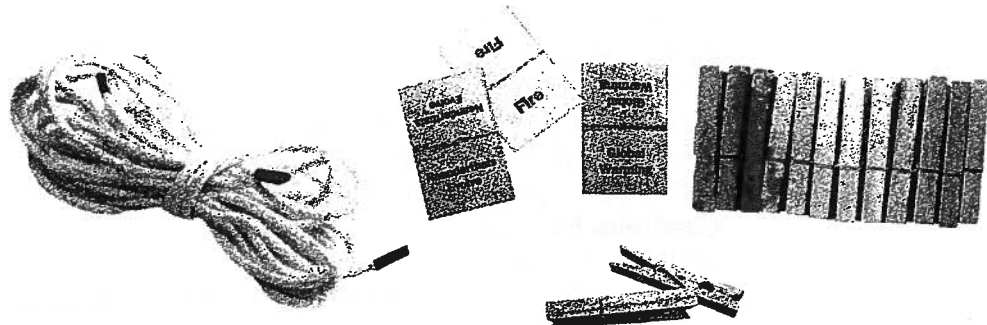
20 minutes

MATERIALS/EQUIPMENT

- Timeline cards
 - 13 blue, 5 green, 6 yellow, and 6 red cards
- clothes line
- 15 clothes pins

TIPS

Have plenty of room to extend the clothes line while maintaining adequate space for foot traffic by non-participants.



PREPARATION

Time estimate – 1-hour minimum to review the timeline cards.
Untangle the clothes line and organize timeline cards by color.

PROCEDURES/ACTIVITY

1. Ask two people to stretch the rope (“time”) between them (or you can tie one or both ends to a tree, a post or doorknob).
2. Tell the group that the line represents a time span equal to the one being examined in that step of the game (4.8 billion years, 50 million years, and so forth).
3. Distribute the **blue** set of cards to members of the group. You could assign cards randomly, or break the group into teams.
4. Ask each to clothespin the card to the line where he or she thinks it belongs. Participants then can see how they did by opening the cards, checking the dates and reading the additional information provided inside about the era in which the specific event happened.
5. This activity can proceed quickly or at a more leisurely pace, depending on time constraints and educational goals.
6. Each timeline is 1/100th as long as the previous one. Once the first step has been completed, you can explain to the group that the next one – spanning the past 50 million years – represents the period covered by only the very last inch of the preceding timeline. This holds true for each of the following timelines, too.
7. The above process is repeated with the green cards, then the yellow cards, and finally the red ones. The same length of rope should be used for each step.

Text of the Timeline Cards and their order

Blue - 5 Billion Years Ago to the Present

Earth

4.8 Billion Years Ago

- The Earth’s first atmosphere is 98% CO₂.
- An asteroid collision tilts the Earth’s axis by 23.5°.
- Global air temperature is much higher than it is today.

Life

3.5 Billion Years Ago

- The first living things appear, simple cells without a nucleus.
- Life in the oceans develops and fails many times; the oceans boil away several times.

Photosynthesis

3.0 Billion Years Ago

- Plants that can photosynthesize appear for the first time.
- $6\text{CO}_2 + 6\text{H}_2\text{O} + \text{sunlight} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$.
- Blue-green algae consume CO₂ and release oxygen.

Continents Forming

2.0 Billion Years Ago

- After a billion years of photosynthesis, the Earth cools enough to allow huge polar ice caps to form.

Fish and Plants

500 Million Years Ago

- The stratospheric ozone layer is developing.
- The Earth's climate is generally mild.
- Predatory fish are evolving rapidly.
- The first land plants appear; they have no leaves.

Present Atmosphere

400 Million Years Ago

- Atmospheric gases stabilize near current concentrations:
 - 78% - Nitrogen
 - 21% - Oxygen
 - 0.003% - Carbon Dioxide
- Water vapor levels vary from 1 to 3 percent, depending on the weather.
- Water vapor is responsible for more than half of the greenhouse effect.

Fossil Fuels Form

300 Million Years Ago

- Large tropical plants cover most of the Earth. Their death, partial decay and burial by sediments produce, over millions of years, vast fossil fuel deposits.
- New England's mountains are forming.

Flowering Plants

200 Million Years Ago

- Magnolias are the first flowers.
- Some dinosaurs evolve into the first birds.
- Palm trees grow in the arctic.

Dinosaurs Disappear

65 Million Years Ago

- This the last of four mass extinctions since life began (99% of all species that once lived are extinct today).
- The Rocky Mountains are still rising.
- The White Mountains are getting shorter as a result of erosion.

Green - 50,000,000 Years Ago to the Present

Mammals

50 Million Years Ago

- Global temperatures are cooling.
- Many animal and bird species are similar to their present form.
- Antarctic ice sheet forms.

Early Hominids

5 Million Years Ago

- Both primate and human ancestral species live in Africa.

Continents Take Current Shape

3 Million Years Ago

- North and South American continents join.

Stone Age

2.5 Million Years Ago

- First arrowheads and axes are developed by humans.
- World population totals about 100,000.

Great Ice Age

2 Million Years Ago

- Our most recent long-term ice age begins.
- There have been 20 periods of glaciation since then.

Yellow - 500,000 Years Ago to the Present

Fire Harnessed

500,000 Years Ago

- Fire is first used by humans for warmth and cooking.

Neanderthals

300,000 – 30,000 Years Ago

- The last humanoid species exists on the Earth.

Homo sapiens

150,000 Years Ago

- Humans appear.

Latest Glacier Retreats

10,000 Years Ago

- Human Age begins.

Humans in New England

9,000 Years Ago

- Maple trees and humans arrive.

Agriculture

8,000 Years Ago

- Hunting and gathering are starting to decline, and the agricultural way of life is beginning to appear.

Red – 5,000 Years Ago to the Present

City States

5,000 Years Ago

- Great civilizations are on the rise in the Middle East and Southwest Asia.

Land Use

1,200 Years Ago

- Earliest evidence of timber harvesting in Europe, doesn't reach America for another 1,000 years.

Coal Combustion

1700's to Early 1800's

- Steam-fired engines are developed.
- The Industrial Revolution begins.

Gas and Oil Combustion

The 1850's

- First oil wells are drilled.
- Industrial Revolution is in full swing.

Mass Production of Automobiles

1900

- Global temperature starts its rapid rise.
- Scientists theorize that human actions can intensify the greenhouse effect.

Global Warming Recognized

Mid-1980's

- Research about and awareness of climate change increase.
- Human activity is identified as an influence on climate.
- World population nears 6 billion