

TIME & THE MAYA CALENDAR

SCIENCE, ASTRONOMY, SOCIAL STUDIES, MATH, HISTORY, GRADES: 5–8

“No wonder Middleworld teeters on the brink of destruction,” said Lord 6-Dog. “For if mortals have forgotten how to read the days, they are doomed to stumble through time like children wandering across a battlefield.”

“What’s the big deal?” asked Max.

The Jaguar Stones, Book One: Middleworld, page 297



ESSENTIAL QUESTION:

What does a calendar tell us about the people who created it?

Sub Questions:

- How did the Maya calendar work?
- How does it compare with other calendar systems?

MATERIALS/RESOURCES:

- Access to research materials and the internet
- Tzolk'in day chart (provided)

OBJECTIVES:

The students will know:

- The origins of several types of calendars and how they function within their native societies.
- The relative nature of time-keeping.

The students will be able to:

- Compare and contrast several different types of calendars and explain their significance to their cultures of origin.
- Identify their own personal ways of measuring time and their significance.
- Demonstrate an understanding of the Maya Long Count, Tzolk'in, Haab and Calendar Round.

RATIONALE:

It is easy for humans to see time as a universal constant, but the way in which it is measured is relative, and says more about the people attempting to measure it than anything else. By investigating calendars, we can learn more about the people who created them.

KEY VOCABULARY:

Solar year: the amount of time it takes for the Earth to complete one orbit around the Sun, or 365 and $\frac{1}{4}$ days.

Gregorian calendar: the calendar system in use today, consisting of 365 days split into 12 months of alternating lengths. Every four years, an extra day is added (February 29th) to realign the calendar with the solar year. This is known as a “leap year.”

Equinox: a day in which, due to the Earth’s orbit, day and night last equal amounts of time, with 12 hours of darkness and 12 hours of daylight. This occurs once in the Spring (March 21st) and once in the fall (Sept. 21st).

Solstice: names for the longest and shortest days of the year, or the days in which the Earth experiences the most hours of daylight and the most hours of darkness. The longest day of the year takes place on June 21st (the summer solstice), while the shortest is on December 21st (the winter solstice).

Long Count: Maya calendar system which supposedly recorded the number of days since the world was created. In this system, years were defined as having 360 days, as opposed to 365.

K’in: Maya unit of time equaling one day.

Winal: Maya unit of time equaling 20 days.

Tun: a Maya unit of time equaling 360 days, or 18 Winals.

K’atun: Maya unit of time equaling 7,200 days, or 20 Tuns (about 20 years).

Bak’tun: Maya unit of time equaling 144,000 days, or 20 K’atuns (about 394 years).

Haab: Maya solar year made of 18 twenty day months and a five-day period called a Wayeb which was considered unlucky.

Tzolk’in: Maya ritual calendar in which each day was associated with certain attributes and fortunes. This calendar, consisting of 20 named days and 13 numbers, was used to determine dates for festivals and rituals, as well as make predictions about the future. It is similar to our Zodiac and its predications not unlike modern horoscopes.

Calendar Round: a combination of the Haab and the Tzolk’in, often represented today as an interlocking set of three cogs.

COMMON CORE STANDARDS:

CCSS.ELA-LITERACY.SL.6.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 6 topics, texts, and issues, building on others’ ideas and expressing their own clearly.

CCSS.ELA-LITERACY.SL.6.2 Interpret information presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how it contributes to a topic, text, or issue under study.

CCSS.ELA-LITERACY.WHST.6-8.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

CCSS.ELA-LITERACY.WHST.6-8.7 Conduct short research projects to answer a question, drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.

CCSS.ELA-LITERACY.RST.6-8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).

CCSS.ELA-LITERACY.WHST.6-8.9 Draw evidence from informational texts to support analysis, reflection, and research.

INTRODUCTORY LESSON: THE MOVEMENT OF THE HEAVENS**Procedure:**

1. As a class, brainstorm a list of celestial objects and events seen in the sky: sun, planets, constellations, meteor showers, eclipses, Northern Lights, etc. Ask the students to choose the object that means the most to them and write a journal entry about the first time they remember noticing it. What was that attracted them? If their first understanding was fanciful (e.g. Moon made of cheese) when did they learn the truth, and how did it change their perception of the object or event?
2. Have the students share their experiences with the rest of the class. As a group, discuss the result. What were some of the common misconceptions about celestial events? How did we discover the truth about these things? Why is the study of astronomy important?
3. Discuss some common myths believed by ancient cultures about the sky and its bodies, such as the Sun's journey across the sky being controlled by Apollo and his chariot, or the Moon's phases being the result of an Egyptian Senet match between several of the gods. Why did they come up with such elaborate explanations? How did these beliefs affect their understanding of the heavens?

Expansion Activity:

Humans continue to be fascinated with the heavens, to the extent that we spend billions of dollars on space exploration, research missions, and shuttle flights every year. Should our resources be directed at issues closer to home? Hold a debate in which one team argues for and another against the importance of space exploration to our society.

ACTIVITY 1: WHAT IS A CALENDAR?**Procedure:**

1. Briefly discuss with the class the concept of a calendar. What is it? What does it do? How does it do it? Can it change or is it constant?
2. As a class, have students list several different calendars (i.e. Scientific Solar Calendar, Gregorian, Julian, Chinese, Russian Orthodox, Jewish, Muslim, etc) and what they know about each.
3. Split the class up into small groups. Assign each group a calendar and ask them to investigate it further. How does it work? When was it used, and by whom? What was it based upon (i.e. the sun, the moon, an equinox, Venus, a non-celestial event)? Did it undergo any changes? What was its relation to the culture who developed it? What made it work for them, and would it work for us?
4. When the U.S. adopted the Gregorian calendar after the Revolution, it caused mass confusion and changed George Washington's birth date from February 11th 1731 to February 22nd 1732. Is there any case for changing it again? Is there a particular date or event from which we might start counting? Hold a mock hearing in which each group presents their calendar idea and makes a case for why the class should adopt it as its "official" timepiece. Encourage students to be as creative as possible in their presentation. Hold a vote at the end.

Expansion Activity:

We all mark time in our own individual ways. For one week, students should record ways in which they personally keep track of time that they may not normally notice. For example, perhaps one recognizes it is noontime when their stomach begins to rumble, while another knows its 6 pm when they hear a parent's car pull in the driveway. At the end of the week, have students write briefly reflecting on their personal time markers, and what those indicators say about them and their culture.

Questions for further discussion:

- How is the study of astronomy linked to our calendar system?
- How does the belief system of the ancients in regard to astronomy affect their understanding of time?
- Given the different natures of calendars, is time something that really can be measured?

ACTIVITY 2: INTRODUCING MAYA CALENDARS: HAAB, TZOLK'IN AND LONG COUNT**Procedure:**

1. Discuss with the class what they have heard about the Maya calendar. Record the major points of awareness and understanding.
2. In groups, have the students research the Maya calendars. They should discover:
 - the Maya had a number of calendar systems: a 365 day solar calendar (the Haab), a 260 day ritual calendar (the Tzolk'in), a count of days starting at the Maya creation date (the Long Count) and the calendar round which brings the Haab and the Tzolk'in together into a 52 year cycle.
 - the Maya had a cyclical view of time and believed the best way to predict the future was to know the past.
 - the Tzolk'in calendar is still being used by traditional Maya peoples today and was the only calendar in use when the Spanish arrived in the 16th century.
3. Each group should produce a poster to graphically explain the calendar systems and how they integrate with each other.
4. As a class review the initial discussion on the Maya calendar and compare their current knowledge to the earlier perceptions. Why did the Maya develop these calendars? What did they use them for? What were the Maya attitudes towards time? Could a Maya calendar end? What was the significance of 12/21/2012 in the long count calendar?

Expansion Activities:

The Maya evolved several different calendars in an attempt to align their concept of time keeping and astronomical belief system with their observations of the Sun and its journey over the course of a solar year. Why was the Sun so important to the Maya and other ancient cultures? Is it still important today? Have students write a journal entry discussing how their lives are affected by the Sun.

Questions for further discussion:

- How is the Sun represented in different cultures?
- How does the Sun relate to our ability to keep time, either with calendars, physical clocks, or internally?
- What other celestial bodies were important to the ancients? Do any of these appear in our calendars today?

ACTIVITY 3: FORTUNE TELLING AND THE STARS

Procedure:

1. As a class, discuss the relationship between astronomy and astrology. The ancients were fascinated by the stars, and believed that the movement of the heavens directly affected their lives on Earth. Is this possible? Is such a belief system present in our own society? (A good exercise is to ask how many students know their own horoscope "sign". Does anyone believe that their personality is similar to the stereotype of their sign?)
2. Ask the students to plan out the Tzolk'in meanings of the days for the next two weeks. They should then write a journal entry addressing the following questions: If they believed in this system, how would the reading affect their activities and behavior over that time? For example, if one day was good for competition, would they be more confident in their soccer game? If it said to avoid confrontation, would they be extra-careful in dealing with friends? How might such beliefs have affected the Maya as a society? A simple calendar conversion tool can be found here: <https://maya.nmai.si.edu/calendar/maya-calendar-converter>

Expansion Activity:

Have the students write a paper in which they examine our modern system of astrology. Is it a worthwhile practice? Do they know anyone who believes in it, or plans their activities around their daily horoscope? How does that belief affect their lives, and change their relationship to what they see in the night sky? Does believing that the stars control Earthly fortunes equate to believing in fate versus free will? Which do the individual students believe in, and how does that belief affect the way they make choices?

ASSESSMENT:

Students should be evaluated based upon their participation in class discussion, group presentations, and their understanding of concepts as expressed in their written work.

Student products will include journal entries, posters, papers, and any products used in their group presentations.

USEFUL LINKS:

Summary of the Maya calendar systems:

<http://jaguarstones.com/maya/mayacalendar.html>

Excellent site about the Maya and their calendar created by the Smithsonian National Museum of the American Indian:

- Calendar intro here: <https://maya.nmai.si.edu/calendar>
- Gregorian to Maya calendar conversion tool here:
<https://maya.nmai.si.edu/calendar/maya-calendar-converter>

Calendars through the ages (includes the Maya calendar):

<http://www.webexhibits.org/calendars/index.html>

The Julian and Gregorian Calendars:

http://www.hermetic.ch/cal_stud/cal_art.html

TZOLK'IN DAY CHART

The Tzolk'in is the Maya ritual calendar, used to predict the characteristics of each day and determine the days for rituals, like a daily zodiac. It is still in use by many Maya today, and it has been kept, without interruption since the time of the Ancients. The calendar is made up of twenty day names and thirteen numbers. It takes 260 days (the average length of a human pregnancy) to go through the full cycle of name/number combinations.

Each day name has a quality, some good, some bad. For example, Imix ("Crocodile") is full of complications and problems, and thus bad for journeys or business deals. (It should be noted that the characteristics associated with each day are not consistent across the Maya region. Below, we've provided just one possible example of these characteristics for use in activity three.)

Day numbers ranged from one to thirteen, where one is the most restrained day, and thirteen is the most extreme. Numbers five, six, seven and eight are well-balanced.



IMIX (Crocodile) A day full of problems and complications. A day to beg divine punishment on one's enemies – but be careful, the gods may decide to punish the one who asks instead.



IK' (Wind) A strong, wild, violent day full of frenzy, fury and rage. It brings violent rainstorms or windstorms without rain. A dangerous day.



AK'BAL (Night) A day of new beginnings, of starting out with a clean slate, a day to look for a girl, plan a marriage or introduce a new baby to the ancestors.



K'AN (Maize) A day for paying one's debts – both worldly and to the ancestors (in terms of neglected duties). In divination, the bigger the number, the bigger the debt.



CHIKCHAN (Snakebite) A day associated with feeling ill or curing illness.



KIMI (Skull/Rebirth) A day associated with asking for good. Kimi days can be used for marriage proposals and ceremonies. A good day for money, business and travel.



MANIK' (Deer) A strong, domineering day. A good day for town meetings.



LAMAT (Star) Ripening, yellowness, harvest, sunset. A day when plans will come to fruition.



MULUK (Water) A day for paying what one owes: favours, work, money.



OK (Dog) A day of jealousy, insecurity and uncertainty.



CHUWEN (Monkey) A day for spinning, winding, rolling up; a good day for trips, business deals and marriage proposals.



EB' (Wild Grass) The road, the good road, the straight road, the long road. It is more than the road you can see with your eyes. A quiet, calm day - good for people and animals.



BEN (Reed) A day where arguments arise from lineage issues.



IX (Jaguar) IX days are to do with the earthly world. A good day for business – since all gold, silver and precious stones belong to the earth.



MEN (Eagle) A good day for financial success, acquisition of wealth, material blessings.



KIB (Candle) A day of patrilineage and asking forgiveness of sins. Kib' is also a good journey and money day.



KABAN (Earthquake) A day for thinking good thoughts, thinking bad thoughts, to meditate, argue, resolve, conclude, or worry. A day one expects civil government to propose a new building or taxing plans – which could be either an excellent or stupid idea.



ETZ'NAB (Blade) A day of concealment, fighting and public scandal. In divining for a marriage, journey or business deal, Etz'nab' would indicate that a fight would result, possibly ending with the jailing of one or both parties and a public scandal.



KAWAK (Lightening) A day to plant and set out offerings. In divining, it means "the table is set" - the ancestors approve of the proposed business deal and it's a good one.



AHAW (Lord/Ruler) A good day for prayers and offerings. A day to ask the ancestors for blessings and hold house-building rituals.