SEVENTH ANNUAL TULANE MAYA SYMPOSIUM &
TEACHER WORKSHOP
TEACHING THE MAYA

February 26, 2010
Tulane University

SPONSORED BY

Photo courtesy of the Latin American Library, Tulane University
Friday, February 26, 2010

9:00 – 9:15 am – *Introduction to the Latin American Resource Center* by Denise Woltering-Vargas
*Greenleaf Conference Room, 100 Jones Hall, Tulane University*

9:15 – 11:30 am - *Introducing the Ancient Maya to the Classroom* by Diane Davies
*Greenleaf Conference Room, 100 Jones Hall, Tulane University*
This workshop will introduce participants with little or no prior knowledge to the ancient Maya. Aspects of the Maya civilization will be discussed with particular reference to rivers and the location of Maya cities. The second part of the workshop will address ways in which to involve the ancient Maya in the classroom, both at primary and secondary level. Teaching resources will also be given.

11:30 – 1:30 pm – *Lunch on your own* (Please see list of on-campus food options)

2:00 - 4:00 pm - *Rivers and Water in the Classic Maya World* by Scott Johnson
*Greenleaf Conference Room, 100 Jones Hall, Tulane University*
This afternoon workshop will cover the importance of water for the Classic Maya. Topics will range from physiological and practical issues related to water, such as farming, to the role of water in the Maya’s view of the world and universe. Information and examples will be drawn from archaeological research, ethnographic accounts, art history interpretation, and Maya hieroglyphic writing.
4:30 – 5:30 pm – Informal tour of Middle American Research Institute collection at the New Orleans Museum of Art with Diane Davies and Denise Woltering-Vargas
New Orleans Museum of Art, One Collins C. Diboll, City Park, New Orleans, LA 70124

6:00 - 7:00 pm – Keynote Address
River Royalty: Kings and Queens of Waka, An Ancient Maya Dynasty by David Freidel
The western lowland Maya relied upon water transport to efficiently move bulk commodities over distance and the San Pedro Martir River was the major water route from central Peten to the western kingdoms. El Peru, ancient Waka', was the capital of the Centipede kings perched on a defensible escarpment above a natural bay on the San Juan River 5 km above its confluence with the San Pedro. As the largest and most ancient city with a realm on the San Pedro, the rulers of Waka' no doubt dominated canoe traffic. Ancient history declares that the Wak kings were strategic vassals to the most important conquerors to forge regional hegemonies in Peten, Siyaj K'ahk' and the "New Order" of the Early Classic; Yuknoom Ch'een the Great and other Snake dynasty kings of the Late Classic. Seven seasons of research at El Peru-Waka' and in the realm around it have confirmed that the rulers there were wealthy and powerful. The elite of the Centipede Water place were also cosmopolitan and regarded themselves as allied with the artists, sages and scribes who were, in their mystical form, denizens of the underworld caves, home of the watery path of the night sun from west to east which took the form of a double-mawed centipede. The history and art of the Centipede people are tied to the great rivers, the real one flowing darkly from east to west, and the mystical one flowing brightly below from west to east.
Biographical Information and Abstracts

Diane Davies
Diane Davies completed her B.A. in History and Philosophy at the University of Leeds, England, followed by a M.A. in Archaeology at the Institute of Archaeology, UCL. She is currently a graduate student at Tulane University and is writing-up her dissertation. She has worked in Peru, along the coast and in the highlands, Puerto Rico and Wales. Her dissertation concerns the reuse of a residential group at the Ancient Maya site of San Bartolo, Peten, Guatemala. Her interests include the development of sociopolitical complexity, household archaeology, mortuary analysis, social memory and identity, and teaching about the Maya in the classroom.

Introducing the Ancient Maya in the Classroom
This workshop will introduce participants with little or no prior knowledge to the ancient Maya. Aspects of the Maya civilization will be discussed with particular reference to rivers and the location of Maya cities. The second part of the workshop will address ways in which to involve the ancient Maya in the classroom, both at primary and secondary level. Teaching resources will also be given.

Scott Johnson
Scott Johnson received his B.A. in archaeology from Boston University in 2005. He has been pursuing his graduate degree at Tulane University since 2006, working at the site of Popola, Yucatan, Mexico, located 13 km SSW of Chichen Itza. His dissertation research focuses on the changing political climate as Yaxuna collapsed and Chichen Itza grew in regional power, from the point of view of a small community located between the two larger sites. He is also interested in Maya epigraphy and experimental archaeology. He has worked at sites in Yucatan, Guatemala, Colorado, Virginia, and England.

Rivers and Water in the Classic Maya World
This afternoon workshop will cover the importance of water for the Classic Maya. Topics will range from physiological and practical issues related to water, such as farming, to the role of water in the Maya’s view of the world and universe. Information and examples will be drawn from archaeological research, ethnographic accounts, art history interpretation, and Maya hieroglyphic writing.
INTRODUCING THE ANCIENT MAYA TO THE CLASSROOM

CLASSROOM ACTIVITIES PACKET

DIANE DAVIES
TULANE UNIVERSITY

TEACHER WORKSHOP SPONSORED BY THE STONE CENTER FOR LATIN AMERICAN STUDIES, TULANE UNIVERSITY, NEW ORLEANS, LA
26TH FEBRUARY 2010
THE ANCIENT MAYA CALENDAR

Friday, February 26, 2010 CE is
Long Count: 12.19.17.2.11
Julian Date: Friday, February 13, 2010 CE
Calendar Round: 2 Chuwen 9 K'ayab
G6: Lord of the night Glyph
http://www.famsi.org/

Maya Calendar: Activities in the Classroom

Objective

Students will be able to:

- Understand and use the Maya Long Count calendar system
- Learn how to write your birthdate in the Maya calendar system

Background:

The Maya calendar, the calendar round of 52 years, consisted of two cycles. The first is of 260
days (the sacred year), representing the intermeshing of a sequence of numbers 1 to 13 with 20
names days e.g. 1 Imix, 2 Ek, to 13 Ben, then 2 Ek (see Maya calendar handout). Every day had
its ritual significance, similar to an astrology chart.
The second calendar was the 365 solar year which had 18 ‘months’ of 20 days each, with 5 unlucky days added to end. The Maya New Year started with 1 pop, the next year would be 2 pop. 1 day such as 1 Kan 2 Pop did not repeat until 52 years passed which was called the calendar round.

Moving on from this was their absolute dating system (‘Long Count’) of 5125 years. Like our own calendar the Maya marked dates for more extensive time from a fixed starting point. In our calendar it’s the birth date of Jesus Christ, for the Classic Maya the beginning of the present creation was 13th August, 3114 B.C. and it ended on 21 December 2012. This round also repeated.
**Important note:** One of the most significant aspects of the Mayan culture was the organization of their society around the concept of the cyclical nature of time. Events occurred and repeated.

**Activities**

- Calculate your birthdate in the Maya calendar: On the FAMSI website there is an interactive date conversion where can type in for example today’s date and it will give you the date in the Mayan calendar. 
  [http://research.famsi.org/date_mayaLC.php](http://research.famsi.org/date_mayaLC.php)
  - FAMSI website also has coloring books you can download for the Maya days and months - [http://www.famsi.org/reports/03075/CKguidebook_english.pdf](http://www.famsi.org/reports/03075/CKguidebook_english.pdf)

- Using the Mayan Calendar handout have students make their own Maya calendar and then give them questions to aid in their understanding of how it works. For example if today is 1 Imix, what will be tomorrow, what date would be yesterday, what date would be next week and so on. Using the sacred year calendar have students make their own prophecies for each day. For example 1 Imix it will rain, 2 Ek is good day to plant seeds and so on.

- **NOVA – PBS-Science** – Documentary on Cracking the Maya Code, see how scientists began to unravel the meaning of Maya glyphs 
  - Using the Calendar Count Worksheet: Have students go through and work out how to convert a Maya Long Count date in days, and also how to work out their birthdate in the Maya Long Count

- The Maya’s long count began on 13th August, 3114 B.C. and is to end on 21 December 2012. This has led to the popular idea that the Maya prophesied that the world is to end at that date. However this is completely a modern invention, for the Maya time was not lineal but circular and ever repeating. 21 December 2012 was only the end of a cycle for the Maya and a new one would begin the next day, much like our New Year’s Eve or end of the millennium.
  - FAMSI website has an excellent discussion with powerpoint of this phenomenon which can cut down or change to your liking. Also has links to news articles [http://www.famsi.org/research/vanstone/2012/index.html](http://www.famsi.org/research/vanstone/2012/index.html)
THE MAYA BALLGAME

(Roll-out Justin Kerr No. 2803)

Objectives

Students will:

- Become familiar with the Maya and their culture.
- Learn about the ancient Maya ball game and its cultural and spiritual significance, and compare it with other spectator sports past and present.
- Learn about Maya myth of creation in the Popul Vuh

Background: Ballgame

The Maya ballgame (pok-te-pok) was only one type of several played throughout Mesoamerica, from the Preclassic period to the Spanish conquest. The game was not only a sport, but also had ritual and political connotations. The Maya ballgame and its associated ballcourts have been symbolically linked to the movement of the sun and moon, which are related to seasonal agricultural fertility. These interpretations are further linked to the depictions of sacrifice
(decapitation) and trophy head paraphernalia associated with the game. Other explanations concern politics and warfare; to legitimate the succession of a king, to mark boundaries or as a substitute for war.

Maya civilization can be divided into three geographical regions; the Northern Lowlands, including Yucatan, Campeche and Quintana Roo (of which ten sites with ballcourts are known), the Central Lowlands which spreads from eastern Tabasco and northern Chiapas, through northern Guatemala, Belize and western Honduras (of which a hundred ballcourts have been reported). Lastly, the Southern Highlands, includes Chiapas and southern Guatemala (three hundred reported examples of ballcourts). Not surprisingly, in such diverse environments, a variety of ballgames were played. At least three types are known during the Classic period in the Lowlands; the hip-ballgame, the hand-ballgame and a stick-ball type. Different rules, rituals and associated paraphernalia were attributed to these games. Examples would be the predominance of the stone yoke with palma and hacha in the Southern Highlands, and the orientation in this area of ballcourts to east-west rather than north-south orientation, which occurs in the Maya Lowlands.

During The Classic period (AD. 300-900) the ballgame achieved its greatest importance, and the majority of Maya ballgame sculpture was carved. The practicalities of the Maya ballgame are as follows; the court was divided into two halves by a line perpendicular to its long axis, and opposing teams faced each other across this dividing line. The Maya wore heavy body padding and belts. The ball; a rubber sphere which is depicted in various sizes, could be hit with the elbows, hips and knees but never the hands or feet. A point was scored for one team when the opposing team failed to return the ball before it bounced a second time, or when the ball reached the opposing end zone (or when thrown through one of the two stone rings, a later addition).

Much of the ballgame symbolism surrounds the relationship between the movement of the ball during play and that of the sun, ballplay being a major ritual activity to influence the ascent and descent of the sun. The sacrificial ceremonies which climax the ballgame were represented by the image of the decapitation of the defeated player, symbolizing death (and eventual rebirth) of the sun or moon. A second major symbolic theme proposed for the ballgame is agricultural fertility, which is inextricably linked to solar symbolism, being a seasonal phenomenon that is marked by the periodic movements of the sun and moon. An alternative interpretation of the ballgame’s function is in legitimating the succession of a king. Kingship can be further linked with warfare, as ballcourts often functioned as a setting for military imagery, perhaps being a forum for opposing groups to compete for social and political status.

Background: The Popul Vuh: A Maya creation story

The Myth of the Hero Twins, Hunahpu and Xbalanque, refers to a ballgame played in the underworld. These twins became great ballplayers and were summoned to a ballgame by the Underworld lords. In their first game, the lords tried to use a skull as a ball, to which the Hero Twins refused. However, they had to undertake several trials in various Underworld houses, in which one, the “House of Bats”, Hunahpu was decapitated. The lords hung his head over the ballcourt and announced that it would be used as the ball at the next match. Yet Xbalanque fashioned a temporary head for his brother’s body and persuaded a rabbit to impersonate the ball, so he could retrieve Hunahpu’s head and restore him whole. Subsequently the Hero Twins rose into the sky as heavenly bodies, namely the sun and the moon.
Activities

- **The Maya Culture in the Classroom** webpage (LARC Resource) has a list of resources compiled from previous Tulane Maya Symposiums. There is a powerpoint presentation on the Maya ballgame by Marcus Eberl which you can download. It contains slides of the ballcourts themselves, a description of game, how it was played and so on. There is also a lengthy description of the Mesoamerican ballgame at this site.
  

- **The Mystery of the Maya**. Video (LARC Resource). Traces the rise of the Maya civilization through artifacts and visits to archaeological sites. Focuses on sites such as Tikal and Chichen Itza, the latter of which contains the largest ballcourt in Mesoamerica. 60 min.
  
  o Alternatively can access online an interactive tour of the site at [http://www.maya-3d.com/](http://www.maya-3d.com/)

- **The Sport of Life and Death: The Mesoamerican Ballgame**. A travelling exhibit organized by the Mint Museum of Art, Charlotte. Great interactive website where students can learn about Maya culture and sites, how the ballgame was played in different areas, what was worn during the game, and the student can both watch and play the game.
  

- **Discovery Education** has a free teachers’ guide (Mystic Lands: Maya: Messages in Stone) which includes classroom activities for teaching the ballgame. Activities include: drawing a mural in the artistic style of the Maya depicting a ball game, comparing the Maya ball game with other spectator sports such as basketball or football, to actually playing the game using the Maya numerical system for keeping score.
  
  [http://store.discoveryeducation.com/product/show/50095](http://store.discoveryeducation.com/product/show/50095)

- **Popol Vuh: The Creation Myth of the Maya**. (LARC Resource). Video. The Popol Vuh was the sacred book of the Quiche Maya written in the middle of the sixteenth century, and is the sole account known that refers specifically to the Maya ballgame (The myth of the Hero Twins). This video portrays the myths included in this book. This video is animated using actual Maya artwork found on pottery and in murals. It is intended for high school and adult audiences. Available in two versions – long or short (60/30 min.).
  
  o **Scholastic Instructor**: This website has a reproducible handout (a comic strip) on the myth of the Hero Twins from the Popol Vuh. It includes the activity of making your own mythological comic.
    
Additional Resources:


**Egyptians, Maya, Minoans.** (LARC Resource) Offers individual and group activities to give students an understanding and appreciation of the Ancient Maya, including a section on the Maya ballgame. Emphasizes writing skills. Junior high/high school.
The Story of the Hero Twins

Read the tale below of the “Hero Twins” Hunahpu (hoo nah poo) and Xbalanque (shaw bal an kay), two famous characters in Maya mythology. The story tells how the twins outsmarted the gods of the underworld, or Xibalba (shee bahl bah), to become immortal.

The twins loved to play ball, but the noise of their playing made the underworld gods angry.

The gods sent messenger owls to summon the twins down to the underworld, called Xibalba.

The gods made the twins stay in the Dark House, which was the first of many scary nights.

The twins escaped by tricking the gods, winning every challenge they faced in Xibalba.

After the last challenge, the twins jumped in a river and turned into magical catfish.

The twins were later reborn as the sun and the moon—more powerful than the underworld!

YOUR TURN! Plan your own mythology comic below, then draw the panels on the back of this page.

CHARACTERS: Who are your main characters? Name them.

________________________________________________________
________________________________________________________

SETTING: Where does your myth take place?

________________________________________________________

PLOT: What happens at the beginning, middle, and end?

________________________________________________________
________________________________________________________

Sketch the first frame of your comic here.
MAYA TRADE

(Top: Chocolate Vessel from Rio Azul (PNAS); Bottom: limestone bowl from Dumbarton Oaks Collection)

Objectives:

Students will

- Learn about Maya trade goods
- Be able to explain some of the similarities and differences between the Maya and U.S. mathematical systems
- Be able to make calculations using the Maya numerical system
Background

Trade

Goods were transported over long distances by canoe and foot transport, as the Maya did not have beasts of burden (such as donkey, ox, or elephant). The nobles wore headdress made of the tail feathers of quetzal bird. They wore cotton and painted their bodies as well as wearing jewelry made of shell and jade. Conch shells were used for pendants, beads, and as trumpets.

Cacao (Chocolate)
Cacao originates from the Maya and was grown mainly in Guatemala. A highly valued commodity, the bean of the cacao tree when processed, became the chocolate used in Maya sauces as well as daily drinks. Cacao beans can be roasted, then easily stored and transported — for that reason cacao became a medium of exchange (currency) in the great market economies of the Postclassic and contact periods. We see depictions of the Classic Maya use of cacao on their painted vessels. A Classic Maya tomb found in Rio Azul, Peten, Guatemala contained paraphernalia of chocolate consumption. A ruler was placed with pottery vessels and 6 cylindrical vases, some of these had rings around their interiors showing that they once contained some dark liquid. One vase had glyphs on which read ‘a drinking vessel for cacao’. Several of these vessels were sent to the Hershey Company and were found to contain chocolate.

Math

The Maya used a vigesimal numeric system (base 20), had the concept of zero and used vertical columns rather than horizontal rows when making calculations.

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Activities

- Maths calculations: add, subtract, multiply or divide, such as if a noble had 100 cacao beans what could he buy if a quetzal feather cost 10 cacao beans, a shell bead 5 cacao...
beans and so on, or if he had 3 shells and a friend gave him 12 shells and then an enemy took away 3 how many shells would he have left, or a merchant sold 2 bowls each day for 8 days, how many bowls did he sell in total. The sums could be written out in the Maya numerical system

- **Unit: A simulation of Mayan civilization during the seventh century** (LARC Resource). Join teams and recreate a confederation of six independently ruled city-states who, through diplomatic cooperation, have pooled their knowledge and traded their goods to establish a powerful empire. Establish team methods to exchange goods in order to meet their goals. Includes activity handouts such as how to make a Maya headdress, or an illustration of the ruler Chan-Bahlum at Palenque to fill in. The students can talk about what he is wearing, calculate how much his outfit would cost and so on.

**Additional Resources**

**The True History of Chocolate:** Sophie D. Coe and Michael D. Coe. Thames and Hudson, 1996. This book draws on archaeology, botany, and culinary history to present a history of chocolate including a section on the Maya

**Excavation Unit Incorporating Maya Archaeology into your Classroom** (LARC Resource) has an exercise on trade and conquest and also “Putting the Pieces Together – Reconstructing a Maya Vase” activity

LARC Resources for the Ancient Maya

The LARC lending library has an extensive collection of educational materials for teacher and classroom use such as videos, slides, units, books, games, curriculum units, and maps. They are available for free short term loan to any instructor in the United States.

These materials can be found on the online searchable catalogue: http://stonecenter.tulane.edu/pages/detail/48/Lending-Library

A few examples:

Videos/Films

Lost Kingdoms of the Maya
This documentary shows the ruins of ancient Maya cities, recreates rituals, and interviews surviving descendants of the Maya. National Geographic. 1993. 60 min.

The Mystery of the Maya

The documentary traces the rise of the Maya civilization through artifacts and visits to archaeological sites. Focuses on sites such as Tikal and Chichen Itza and discusses the collapse of the Classic Maya cities. 60 min.

Ancient Civilizations: The Mayans

In this program, archaeologist Ian Graham delves into Mayan history, investigating topics such as the Maya mastery of mathematics, their extremely hierarchical society, and Maya art. Many examples of Maya architecture are provided as well, plus a computer re-creation of the temple at Chichen Itza. 1999. 47 min.

Popol Vuh: The Creation Myth of the Maya

Portrays the creation myth of the Quiche Maya of Guatemala. These myths surrounding the birth and death of the first fathers of the underworld. This video is animated using actual Maya artwork found on pottery and in murals. It is intended for high school and adult audiences. 1986. 60 mins/29 min.

Lighting the Ancient Past: Exploration of Maya Caves

The documentary uses elaborate Maya Cave paintings to introduce and illustrate Maya history and culture to younger students. Middle school and high school. 1987. 17 min.
Books

Egyptians, Maya, Minoans.

This well-designed reproducible book presents information and activities on three ancient civilizations. Offers over sixty individual and group activities to give students an understanding and appreciation of Egyptian, Mayan, and Minoan culture. Includes activities such as build your own Maya temple-pyramid, deciphering glyphs, the Maya pantheon, Maya math, myths, dress, and social structure. Emphasizes writing skills. Junior high/high school.

Maya Designs

This book, written by Wilson Turner and published by Dover Books, has traceable line drawings of ancient Mayan art designs, hieroglyphics, and codices. Each drawing has an explanatory caption. 1980.

Aztec, Inca & Maya

Eyewitness book comparing the three major pre-Columbian civilizations of Latin America. This book is filled with photographs of masks, pottery, tools, etc., as well as illustrations of buildings and rituals. Many topics are covered, and the detail level is geared towards elementary school students.

Units

MAYA – A Simulation of Maya Civilization during the Seventh Century

A simulation of Mayan civilization during the seventh century. Your students will: join teams and recreate a confederation of six independently ruled city-states who, through diplomatic cooperation, have pooled their knowledge and traded their goods to establish a powerful empire. Establish team methods to exchange goods in order to meet their goals. Acquire certain goods in order to meet the minimum requirements for the sacrifices that are an integral part of Mayan culture. Receive team packets of partial information that, when completed, will form a complete book of knowledge about the Mayans. Learn the secret meanings of the Mayan number system, the complex Mayan calendar, and the principal Mayan deities and prophecies. Participate in daily team meetings to decide what to trade and to make sure everyone is on task. Hold an evaluation/debriefing on what they have learned about Mayan culture. Teacher Guide and 35 Student Guides.

Curriculum Units

http://stonecenter.tulane.edu/pages/detail/202/Publications-and-Online-Resources

- Including a curriculum guide for a Yucatec Mayan family
Maya Culture in the Classroom: Includes powerpoints and descriptions on the Maya ballgame, maps, Mesoamerican timelines and Mesoamerican links

- **Dylan J. Clark and Jessica A. Deckard: Excavation Unit: Incorporating Maya Archaeology into Your Classroom:** contains many classroom activities
General Resources for the Ancient Maya

Books and Articles

The Popul Vuh: A Sacred Book of the Maya: Victor Montejo. Groundwood Books, 2009. For ages 9-12. Wrathful and kindhearted gods, giants, mortals, jaguars, and colorful birds are some of the characters and creatures that inhabit this creation story and genealogy recorded in the K'iche' language in 1558 and discovered in 1701 by a Spanish priest. Children will enjoy this accessible retelling of a story that has largely been unavailable in English. Vivid characterizations, tales of revenge and forbidden fruit, tests of wit and strength, and explanations of why deer have short tails and monkeys live in trees are all here. Full- and double-page paintings rich in color and detail illustrate the volume.


Make a Maya pyramid. Mix up a chili chocolate drink. Create a macaw headdress. While reading The Maya, you'll have a great time exploring the cultural traditions of this innovative people as you learn to write in the Mayan language, make a mosaic jade mask in the likeness of one of their rulers, and test your skills as you play Maya games. This book is filled with activities and projects that will show you how the Maya people lived and played. You'll learn about the bravery of Maya warriors as you construct a war shield. You'll discover how to read ancient Maya hieroglyphs and even create your own glyph rubbing, just like the scribes used to do. You'll get to solve math problems using Maya numbers—and then come up with your own problems to try on your friends. Plus, you'll find lots of amazing Maya facts on topics ranging from history and government to foods and arts to science and architecture.

Mario's Mayan Journey: Michelle McCunney. Mundo Publishing. 1997. Ages 4-8. Mario, a young Mexican boy, is fascinated by stories of the Mayan people and their artifacts. He dreams himself into a jungle setting with a boy and girl who switch to Spanish when he doesn't understand their Mayan language and take him on a journey into the past. Flamingos carry the three to the Temple of the Warriors in Chichen Itza where they see a mural that depicts Mayan life. They then journey on foot into the surrounding jungle and make a shelter as night falls. Mario awakens in his own bed and decides to capture the journey in murals that fill the walls of his room. Pastel watercolors portray an uncharacteristically pale jungle inhabited by toucans, quetzals, and white pelicans as well as turtles, monkeys, and jaguars. A glossary with pronunciation guides defines such unfamiliar words as anthropology, Chichen Itza, ocelot, etc.


research in Central America, this study appeals to those interested in the ecological bases of civilization, the function of the state and the causes of the collapse of civilizations.

Internet Resources

**FAMSI:** Excellent website for Mesoamerica. Includes information on the ‘end of the world’ issue, interactive – date conversion where you can type in a date and it will give you the date in the Mayan calendar. Detail on Maya and other Mesoamerican sites. Also has a teacher’s guide book as well as guides and coloring books on the Maya glyphs, Maya days, and Maya months.  

**Maya Archaeology of Mesoamerica Resource.** Reports on Maya Archaeology for example the Foundation for Latin American Anthropological Research has books concerning plants utilized by the Maya, flowers, caves in Mesoamerican culture, incense, sacred food and drink, bats in Maya culture, and Maya art rollout of vases  

**Mesoweb:** This website has tours of Maya sites such as Tikal and Copan, photos and descriptions, also has a section for teachers which is in progress.  
[www.mesoweb.com](http://www.mesoweb.com)

**Mesoamerican Ballgame:** Excellent interactive site on the Mesoamerican ballgame where you can watch and play the game  

**Justin Kerr:** Database of Maya vase rollouts and of Precolumbian photographs  
[www.mayavase.com](http://www.mayavase.com)

**Nova (PBS)** website contains the ‘Cracking the Maya code’ documentary, showing how scientists began to unravel the meaning of Maya glyphs. Includes a classroom activity for students where they can determine their own birth date using the Maya Long Count calendar system.  

**NOVA** documentary ‘Lost King of the Maya’ including a tour around Copan  

**NOVA** documentary: ‘Maya’ NASA archaeologists use satellites to pinpoint ancient Maya ruins buried deep in the jungle.  
[http://www.pbs.org/wgbh/nova/sciencenow/3401/03.html](http://www.pbs.org/wgbh/nova/sciencenow/3401/03.html)

**A Puzzle in the Peten:** at Waka, an archaeological dig in the Peten. The site details the practicalities of excavating such as setting up camp and so on.  

**Middle American Research Institute, Tulane University**  
Website for Mexico and Central America. Online catalogue of Mexican, Panama, and Guatemalan textiles. Digital Media Archive for Mesoamerica  
[http://www.tulane.edu/~mari/](http://www.tulane.edu/~mari/)
Maya 3D - 3D exploration of the Maya world focusing on the site of Chichen Itza
http://www.maya-3d.com/

Mesoamerican Archives: Photos of Mesoamerican archaeological sites by David Hixson, a graduate student from the Anthropology Department at Tulane University.
http://www.mesoamerican-archives.com/

The Science Museum of Minnesota presents Maya Adventure, a World-Wide Web site that highlights science activities and information related to ancient and modern Maya culture. Maya Adventure includes images from the Science Museum's anthropological collections and activities developed by the Science Museum's education division. Featured in the project is information from two exhibits about the Maya developed by the Science Museum of Minnesota, Cenote of Sacrifice and Flowers, Saints and Toads.

Archnet – Archaeological Research Institute at Arizona State University: Educational Resources
http://archnet.asu.edu/default.php

Discovery Education: A news report on the Classic Maya with classroom activities

Science Netlinks: Resources for K-12 science educators – for example why civilizations fall. Uses the site of Copan to discuss this and has classroom activities
http://www.scienccenetlinks.com/index.php

Learner.Org: Teacher professional development and teacher resources across the curriculum Why civilizations fall interactive topic using Copan as an example

National Geographic: Lesson plans, activities and maps for the Maya
http://www.nationalgeographic.com/xpeditions/

Discover Education: Maya ballgame lesson plan and classroom resources

The Ancient Web: Resources for the Maya as well as the Olmecs, and Aztecs
http://www.theancientweb.com/

How stuff works: On the Maya calendar and the end of the world predictions, interactive activities
http://history.howstuffworks.com/central-american-history
K-12 Educator's Workshop:

Water and the Ancient Maya

Tulane's 2010 Maya Symposium
Friday, February 26th, 2010

Scott Johnson
sajjohnson@gmail.com

Department of Anthropology
Tulane University
General Maya References:

Maya Civilization
- *The Ancient Maya*, by Robert Sharer and Lola Traxler
- *The Maya*, by Michael Coe
- *Ancient Maya Civilization*, by Norman Hammond
- *Forest of Kings: the Untold Story of the Ancient Maya*, by Linda Schele and David Freidel.

Maya Archaeology
- *Maya Archaeologist*, by J. Eric S. Thompson
- *In Search of Maya Sea Traders*, by Heather McKillop.
- *Unfinished Conversations: Mayas and Foreigners Between Two Wars*, by Paul Sullivan.
Editor
Ann H. Fuerst, Ph.D.

*San Diego Museum of Man*

/ MAYA ART /

Classroom and Museum

ACTIVITY BOOK

*San Diego Unified School District*
Books in English for Students on the Maya and related topics

**Grades 2 and younger**


Nursery rhymes and beautifully illustrated pages in color including rhymes and scenes of a molinillo.


This attractive adaptation of a Mayan legend tells why the gray cuckoo lost its feathers and has to borrow the nests of other birds to lay its eggs.

McKissack, Patricia. *The Maya*. Children's Press. 1985. 48pp. $8. (Gr. 2-4)

Easy to read text and excellent graphics reveal this pre-Columbian civilization to young readers.

**Grades 3-6**


This intriguing collection of six pre-Columbian legends and riddles about plants, flowers, and fruit is strikingly illustrated.


Another incredible book from the Eyewitness series with lots of great illustrations, photos, and information.


Beautifully illustrated in color with art objects and sites. Includes life in Maya lands and the end of Maya Cities. Glossary and Index.


Story about a Central American adolescent boy who learns how to make his own paints. A beautifully illustrated fictional story.


Get your scissors ready for this activity kit. There are puzzles, masks, and even a roll-out of a cylindrical vase to cut out. The activities and folktales are geared for the younger child, but the images and bright colors are for everyone! Packed in a folder for easy storage.


Authentic drawings based on Maya wall paintings and designs. Many aspects of the Maya civilization including the arts and history-social science.


This book is not at the reading level of youngsters in grades 3-6, but since California students especially are studying California missions within these grades, they may be excited to see the maps and locations of the Spanish Colonial Churches of Yucatan. Copies available through Los Angeles County Museum of Art book store.


A legend retold in a fast moving, exciting narrative. But thumbs down on the illustrations.


In this dramatic, original tale set in the ancient Maya civilization, a young ball player challenges the rain god to a game of pok-a-tok to end a terrible drought.

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1 Many of the entries on this special list are made possible through the scholarship of Isabel Shon, Director of the Center for the Study of Books in Spanish for Children and Adolescents, California State University, San Marcos, California. Isabel Shon. *Books in Spanish for Children and Young Adults: Series II*. Metuchen, N.J.: Scarecrow Press, 1995 and other publications. Please refer to the INTERNET information in this book to contact this Center.
Grades 7-9


The story begins with the Maya 5000 years ago and ends with today. Ceremonial centers and festivals. A clear presentation of gods is given.


The fictional tale of Isabel Pacay, a Maya teenager trying to pursue a dream and to search for her identity.


The ruins of Tikal and other sites are included in the illustrations of this book, which is mostly about modern life in Guatemala.


About an Indian family in Guatemala. Complete black-and-white photos of family life, art activities, and customs.


Stunning watercolor illustrations of ruins and sculptures. Use as a background to the study of Maya religion.


A sense of dignity and pride for the Indians is revealed with beautiful photos, including photos of ruins.


A 12 year old Maya Indian boy takes on his father's responsibility for growing corn. The story is about a boy's maturation and the importance of corn in the lives of Maya Indians. The Hutz Meek celebration is included.


This is an anthology of Hispanic-American literature for young people. Includes one Maya tablet and a beautiful poem about it.


Dramatic color presentation of figurines from Jaina and Pacal's lid. Other nice representations and photos in black and white. Covers the origins and survival to the modern Maya.

Adult:


One of the great Maya scholars writes about the Maya glyphs. An exciting chapter called "Paacal's People" is a must for teachers. It tells how modern scholars discovered the meaning behind the glyphs and stones of Palenque.


A book about John Lloyd Stephens, the discover of the Maya. Frederick Catherwood's illustrations throughout.

Books in Spanish on the Maya and related topics

Grades 2 and younger


Nursery rhymes and beautifully illustrated pages in color including rhymes and scenes of a molinillo.


This attractive adaptation of a Mayan legend tells why the gray cuckoo lost its feathers and has to borrow the nests of other birds to lay its eggs.

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Grades 3-6

Bohorquez, Rossana. **LA DANZA DE YAXUM (Yaxum's Dance)**. 968-24-2997-8. $4.55.

The beautiful tale of Yaxum, a young Maya who loved the sun so dearly that he wished to offer a dance in appreciation of its existence. He asked advice of an old dancer and of different animals on how to learn to dance. He observed nature and imitated its movements with patience and discipline, until one day he was ready to offer the loveliest and grandest dance possible to the sun.

**EL MEKIN Y LA SERPIENTE (Elmekin and the Serpent)**. 968-24-2335-X. $4.55.

A fantasy story in which a Maya youth is guided by a serpent to see the world around them. The serpent encourages the youth to really see and appreciate the grandeur all around him. Later when the youth is creating his own pottery designs the true significance of the serpent's message comes to him.


Colorful illustrations, black-and-white photos, and photos in color add to the appeal of this book.


Life in rural Mexico is beautifully described with stunning watercolor illustrations. Celebration of the corn harvest and activities related to the eating and growing of corn in Mexico.

Grades 7-9

Acosta, Virgina García. **LOS SEÑORES DE MAIZ: TECNOLOGIA ALIMENTARIA EN MESOAMERICA (The Masters of Corn: Food Technology in Middle America)**. 968-6177-33-7. $7.95.

García, Horacio and Norma Herrera. **LOS SEÑORES DEL TIEMPO: SISTEMAS CALENDARICOS EN MESOAMERICA (The Masters of Time Systems in Middle America)**. 968-6177-334-5. $7.95.


All about chocolate from pre-Columbian times. It's all about plantations, chocolate in literature, and the social role of chocolate, as well as recipes.


Winner of the Mexican National Prize for Children's Literature in 1982. The author calls plants and animals by their ancient names and gives them life in this collection of fables about Mexico's indigenous past.


The search for an archaeological treasure and the necessity to save the Mexican cultural heritage is the subject of this cleverly written adventure.


Small paperback with sepia-like illustrations discusses the Maya society and other pre-Columbian cultures.


The history of the conquest of Mesoamerica, which lasted almost 200 years and ended with the surrender of Tayasal, the last independent Maya City.


The lyrical retelling of a beautiful Guatemalan folk tale, the legend of chirimia, whose music is sweeter even than that of the birds. A young man's love for a Maya princess sends him on a quest for the purest song in the woods. Vibrant illustrations based on ancient stone carvings of the Maya civilization.
Social Studies:

**Upper Level Students**
- Folklore
- Religion and Worldview
- Maya Economy and Trade
- History Unit on Maya or other Ancient Culture
  - *The Maya*, by Michael Coe

**Lower Level Students**
- Folklore and Stories
- Rural, hand-farming lifestyle explanation.
- Foods: tamales, tortillas, pumpkin seeds.
Time Lines of Culture

Ancient Maya art and architecture may be divided roughly, chronologically, into three phases of cultural and artistic development: 1) Pre-Classic, 2) Classic, and 3) Post Classic. It is the Classic period that this book is most concerned with. Briefly, it is discussed below.

The Classic period of Maya culture began around A.D. 250 and lasted until about A.D. 900-950. This time period is marked by the development of mathematics, non-telescopic astronomy, calendrical calculations, great architecture, a highly developed writing system, the high art of vase painting, and elaborate ceramics. In the lowlands, the Classic is defined as the beginning of the stela-altar complex. This time period is divided into Early, Middle, and Late Classic.

Early Classic (A.D. 250-480)
The Maya culture showed a strong influence from the central valley of Mexico and the culture that lived at Teotihuacán at this time. Those from Teotihuacán actually set up outposts in the northern zone of Maya land. The eruption (A.D. 260) of Mount Ilopango in El Salvador brought in a migration of new people from the south with new ideas, as shown by the increased use of mounds for houses and burials.

Middle Classic (A.D. 480-600)
Revealing much less of the Teotihuacán influence, the Middle Classic period (A.D. 480-600) coincided with the economic problems taking place there. Within the Maya land, those at the site of Caracol defeated Tikal in A.D. 556 and reigned over Tikal for the next 140 years. In the rest of the Maya area, archaeologists found a decline in the number of sites where the Maya erected dated monuments. They also found poorer burials and muted artistic expression.

Late Classic period (A.D. 600-900/950)
A rise in power of the local Maya leadership showed up in the Late Classic period (A.D. 600-900/950). Over 300 cities were found in the Maya area and as many as 60 kingdoms at the height of the Late Classic period. The population increased. Evidence of house mounds indicates there was a population of 400-500 per square mile around urban centers. The average family size was believed to be 5.6 persons. At Tikal, the population was estimated to be 500,000. The ruling elite may have encouraged population increases to support building programs, wars, and their elaborate life-style. Setting the stage for disaster was the clearing of more forest land for agriculture. This caused erosion, but the food was needed to support the increased population. The more people there were, the greater need the Maya had for increased social stratification and building. This caused more strife between the Maya city-states. On the other hand, this was a period of beautifully proportioned architecture, detailed inscriptions, and fine workmanship.

End of the Classic period (c. A.D. 700)
The collapse of the period began around A.D. 700 with a decline in learning, public architecture, and general aesthetics. But, it also brought about an increase in militarism, commerce, and strong ties with central Mexico, the Toltecs, and the Itza people. There had been no apparent attempt to promote political integration between city-states. The primary purpose of their wars seems to have been to take prisoners for the prestige of the conqueror and for sacrifice.
Chocolate Drinks

_Cacao_ was one of the most important harvests of the Maya. The cocoa bean and the drink made from it was so valuable, only the nobility were allowed to drink it. It may have been served in cylindrical clay pots.\(^1\) It was reported in the 16th century that this drink was a foaming drink used at celebrations. The Maya ground the cacao until it became a grease that looked like butter. They also ground maize to add to it. The mixture was thinned with water and flavored with chili water, flowers, vanilla, or honey.\(^2\) Even today, beverages are made from ingredients of corn and cacao beans.

Parents are great resources for schools to have. Olga Velázquez is photographed here in her home kitchen with her son Sergio. On the left she breaks up the chocolate tablets as Sergio gets ready to add more milk. On the right she uses the _molinillo_ (wooden whisk-like implement) to blend the cooked ingredients. Photographs by Ann Fuehrer in Chula Vista, California.

**Velázquez’s Hot Chocolate**

2 cups of milk
1 round tablet of Mexican chocolate\(^3\)

Measure 2 cups of milk into a saucepan. Break up the tablet of Mexican chocolate and add to the milk. Cook over medium heat about ten minutes. When it begins to boil, take the _molinillo_ between the palms of your hands and rotate it like a handy blender around the edge of the pot and through the contents of the saucepan. Serve the chocolate while still hot and frothy.

**Velázquez’s Atole de Masa (6 to 8 servings)**

| 6 cups of water | 1 can evaporated milk |
| 2 sticks of cinnamon | ¼ cup instant corn masa |
| 4 cones of _piloncillo_\(^4\) (or 1 cup dark brown sugar) | ½ cups of water |

Making atole is a Mexican tradition even enjoyed by the ancient Maya. Today, as then, it is usually served with tamales. Measure and pour the six cups of water into a large clay pot with the cinnamon sticks. Bring to a boil. Add the _piloncillo_. When the sugar cone has dissolved, and the water boils again, add the canned milk. Meanwhile, in a separate clay bowl, mix water with the corn masa until it is very smooth. Gradually add the corn masa “batter” to the hot liquid, pouring it through a strainer. Stir constantly with a wooden spoon for about 10-15

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3. Be sure to use a Mexican chocolate tablet because it already has a sweetener in it.
4. A solid cone of brown sugar usually available where Mexican specialty foods are sold.
minutes until it thickens. You can add more corn masa "batter," as you stir, to the hot liquid to make it thicker. Flavorings like chocolate may be added to this "base" or just enjoy it as it is.

**Velázquez's Champurrado**

10 cups of water
1 can evaporated milk
2 sticks of cinnamon
1 cup white granulated sugar
4 round tablets of Mexican chocolate
¾ cup toasted all-purpose flour (with 2 cups water)

Measure water into a large pan. Add the cinnamon and bring it to a boil. Next, break up the four tablets of Mexican chocolate and add to the hot water. Stir the chocolate mixture until all the chocolate is dissolved. Continue stirring and add the milk and sugar. Bring to a boil. In a small bowl of toasted flour, mix in the water until smooth. Gradually add the toasted flour "batter" to the boiling liquid. For a smoother drink, use a strainer when adding the "batter" to the hot water. Stir constantly for about 10 minutes until the champurrado thickens. More toasted flour can be added during the cooking time if a thicker drink is desired. Serve and enjoy! Next time, for a different taste, make it with corn masa instead of flour.

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**Toasted Flour**

The flour may be toasted a day or two ahead, cooled, and stored in an air-tight container. To toast the flour, use a small frying pan, and a wooden spoon. Measure the all-purpose white flour into the pan over medium heat. Stir constantly so it browns, but does not burn. Cool and store.

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*Atole de Masa.* Olga Velázquez demonstrates how to make the drink the Maya enjoyed. Glyphs on small decorated clay bowls described the contents as being similar to that enjoyed by modern-day Mexicans. (Left) This Chula Vista School District parent shows her two sons how to make atole in a clay pot. (Right) After the water is heated, and the milk is added, Olga gradually adds a batter she has made with instant corn masa and more water. She likes to serve the atole with tamales, another dish the Maya enjoyed. Maya vase painters illustrated tamales, or similar-looking food, served on plates.
Literature:

Upper Level Students

- Mythology and Legends
- Discuss oral vs. written history, using Maya examples.
  - The Mayan Folktale: An Introduction, by Fernando Peñalosa.
- Some Recorded Oral History
  - Book of Chilam Balam of Chumayel, by Ralph Roys.
  - Post-Conquest Mayan Literature, edited by David Bolles.
- Some Anthologies of Maya Folktales
  - An Epoch of Miracles: Oral Literature of the Yucatec Maya, by Allan F. Burns.
  - The Bird Who Cleans the World and Other Mayan Fables, by Victor D. Montejo.
  - Mayan Folktales: Folklore from Lake Atitlan, Guatemala, by James D. Sexton.

Lower Level Students

- Folklore and Stories
- Some Books with Maya Stories for Children
  - The Deekatoo, by John Bierhorst.
  - Myths of Precolombian America, by Anita Delal.
  - The Bronze Cauldron, by Geraldine McCaughren.
  - The Race of Toad and Deer, by Pat Mora.
Mathematics:

Upper Level Students

- General Math: Teaching base-20 math

Like most western number systems today, the Maya used place notation to express large numbers. Our number 1,492 has one 1000s (10^3 x 1), four 100s (10^2 x 4), nine 10s (10^1 x 9), and two 1s (10^0 x 2). We know the relative value of each number because of its position in relation to the other numbers: each unit is ten times larger than the one to its right. The Maya also had the concept of zero, a place-holder in a place-notation-based system, well before the western world. Unlike most western number systems which are based in groups of ten, the Maya based theirs in 20, called a vigesimal system. Although this may sound strange or difficult, especially for those who do not enjoy math, it is really as easy as our system once you learn how it works. Because each place can go from 0-19, a dot is used to separate significant places. For instance, the number 1.13.12 has one unit of 400 (20^2 x 1), 13 units of 20 (20^1 x 13), and 12 units of 1 (20^0 x 12). Each position to the left raises the unit value 20-fold (just like in our system which increases by 10-fold). This would be converted to 672 in our number system (1 x 400 + 13 x 20 + 12 x 1), although the conversion between the systems is only needed for correlating the Maya calendar with our own. You can do addition and subtraction with the Maya vigesimal system just as easily as with our own with just a little practice. For instance, adding the numbers 1.13.12 and 3.6.14 is easy. By adding 12 to 14, you get 26, which is six more than the 20 that can be held in any one place, so the 20 are converted into one of the next-highest place (to the left) and six are left in the one's place. Similarly, the 20s place is added up to 20 (1 + 13 + 6) and again, this hits the maximum amount for a position and 20 is converted to one in the next-highest place, leaving zero for the 20s. Finally, the 400s are added up to equal five with no need to go to the next highest place.

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>1</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>01.13.12</td>
<td>01.13.12</td>
<td>01.13.12</td>
</tr>
<tr>
<td>+</td>
<td>+03.06.14</td>
<td>+03.06.14</td>
<td>+03.06.14</td>
</tr>
<tr>
<td>=</td>
<td>26</td>
<td>20</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>06</td>
<td>00.06</td>
<td>05.00.06</td>
</tr>
</tbody>
</table>

If you like to double check your arithmetic, you can convert all of the numbers to decimal and use a standard calculator (672 + 1334 = 2006). For your convenience, chart 3.1-1 can be used to convert vigesimal (base-20) numbers into decimal (base-10).

<table>
<thead>
<tr>
<th>Chart 3.1-1</th>
<th>Vigesimal to Decimal Conversion</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Transpose the vigesimal number into the following form, starting with the right-most number and then add the products down.</td>
<td></td>
</tr>
<tr>
<td>12.14.06.00.15.02 is used as an example, for larger numbers, continue to increase the units size by a power of ten.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>12</th>
<th>x</th>
<th>1</th>
<th>(20^0)</th>
<th>=</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>x</td>
<td>20</td>
<td>(20^1)</td>
<td>=</td>
<td>200</td>
</tr>
<tr>
<td>03</td>
<td>x</td>
<td>400</td>
<td>(20^2)</td>
<td>=</td>
<td>0</td>
</tr>
<tr>
<td>11</td>
<td>x</td>
<td>8,000</td>
<td>(20^3)</td>
<td>=</td>
<td>160,000</td>
</tr>
<tr>
<td>11</td>
<td>x</td>
<td>160,000</td>
<td>(20^4)</td>
<td>=</td>
<td>1,280,000</td>
</tr>
<tr>
<td>08</td>
<td>x</td>
<td>3,200,000</td>
<td>(20^5)</td>
<td>=</td>
<td>12,800,000</td>
</tr>
</tbody>
</table>
Great, so now that we can convert vigesimal numbers into decimal numbers, let's take a look at how to recognize numbers in the inscriptions. Figure 3.1.1 has two of the three types of numerals we see in Maya writing: bar-and-dot and head variants. The third way to represent numbers in Maya inscriptions is with full-figure depictions, which we won't discuss here. Bar-and-dot numerals are by far the most common way the Maya represent numbers. A dot represents a one and a bar represents five. No more than four dots are used at once, any number over four uses bars for each multiple of five. A combination of up to four dots and three bars is used to represent numbers from one to 19. One bar, three dots is eight, three bars, and two dots is 17, and so on. As mentioned before, the Maya were the first society to have represented zero. This was done with a flower-shaped glyph in the inscriptions and a conch shell in the codices.
Figure 3.1 – 1

Numbers
Bar-and-dot and head-variant numbers with respective transcriptions, transliterations, and transcriptions.

0  mih
zero

1  ju'n
one

2  cha'
two

3  ox
three

4  chan
four

5  ho'
five

6  wak
six

7  huk
seven

8  waxak
eight

9  b'olon
nine

10  laju'n
ten

11  b'uluk
eleven

12  lajchan	twelve

13  oxlaju'n
thirteen

14  chanlaju'n
fourteen

15  ho'laaju'n
fifteen

16  waklaju'n
sixteen

17  huklaju'n
seventeen

18  waxaklaju'n
eighteen

19  b'olonlaju'n
nineteen

20  ku'al
twenty
Inscriptions for 3.1-1 through 3.3-4 Exercises
Use these five inscriptions to complete the following exercises.

- **Palenque**
  Temple of the Sun Tablet

- **Piedras Negras**
  Stela 1

- **Yaxchilan**
  Lintel 21

- **Tikal**
  Stela 31

- **Tonina**
  Monument 139
Exercise 3.1-1

Convert Maya Numbers to Arabic Numerals
1. For each of the five inscriptions, write out each number in the spaces below.

<table>
<thead>
<tr>
<th>Palenque</th>
<th>Piedras Negras</th>
<th>Yaxchilan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tablet of the Sun</td>
<td>Stela 1</td>
<td>Lintel 21</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tonina</th>
<th>Tikal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monument 139</td>
<td>Stela 31</td>
</tr>
</tbody>
</table>

Exercise 3.1-2

Maya Number Arithmetic
1. Complete the following equations, writing the answers in bar-and-dot numerals (remember place values increase from bottom to top).

\[
\begin{align*}
\text{I} & \text{V} + \text{I} \text{V} = & \text{I} \text{V} \\
\text{I} & \text{I} & \text{I} + \text{I} \text{V} & = & \text{I} \text{V} \\
\text{I} & \text{I} & \text{I} + \text{I} & \text{I} = & \text{I} \text{I} \text{I} \\
\end{align*}
\]

Exercise 3.1-2

Maya Numbers to Decimals
1. Convert the following Maya numbers (vigesimal, base-20) to decimal (base-10) numbers.
- Geometry: Calculating the volume of a Chiltun (cistern), how large the catchment should be, and supporting populations.
  - A chiltun is a large, underground cistern to hold drinking water. Chiltuns are generally cylindrical and vary from 1 - 4 m in diameter. Each person needs 8 liters of water per day for the 4 months of the dry season. If 1 liter of water equals 1/1000th of one cubic meter, how deep must a 1-m-diameter chiltun be to hydrate a family of four for 4 months (assume average month of 30.5 days)? (1.243 m) What about a 3-m-diameter chiltun? (0.414 m)
  - Chiltuns are filled from a water catchment area of paved plaster above the cistern. If the catchment area is circular, how large must the diameter of the catchment area be to gather enough water for four people for 4 months if the rainfall rate over the 4 months of the rainy season is 500 mm per month? (0.621 m)
  - How many 2-m-diameter, 3-m-deep chiltunes must you have to sustain a population of 10,000 over the 4 months of the rainy season? (518 cisterns)
- Problem questions regarding transporting goods by canoe, paying upkeep for people each night/day, returns on investments, etc.
  - Imagine you are a classic Maya trader. There is no formal monetary system and all exchange must be done by barter. If you start Yucatan (the north) with a shipment of salt and honey and plan to canoe with a crew of 10 paddlers down to southern Belize to exchange these goods for jade and obsidian.
    - It takes 20 days to travel by canoe from your home in the north, to your trading destination, and the same to return.
    - Each paddler gets 1 salt cake for 10 days paddling.
    - Each port charges 1 salt cake for an overnight stay.
    - One salt cake can be traded for 3 honey pots in Yucatan.
    - One salt cake can be traded for 5 honey pots in Belize.
    - One jade figurine can be traded for 15 salt cakes in Belize.
    - One obsidian core can be traded for 30 honey pots in Belize.
    - One jade figurine can be traded for 60 honey pots in Yucatan.
    - One obsidian core can be traded for 18 salt cakes in Yucatan.
  - Using the information above, answer the following questions:
    - How much salt must you have on hand to pay your paddlers for a round trip? (40 salt cakes)
    - If you have 200 salt cakes to start your journey, and you have to pay your paddlers at their rate plus each day at the ports along the way, how much salt do you have to trade when you reach Belize? (120 salt cakes)
    - What commodity from Belize gives the best return on investment? (obsidian)
    - If you start with 200 salt cakes in Yucatan, and you can trade for honey before you leave, would you? If so, why and how much?
    - Start with 300 salt cakes, and trade for commodities in Yucatan, travel to Belize and trade commodities again, and travel back to Yucatan and convert all commodities to honey pots. What is the maximum number of honey pots you can earn? Remember to pay your 10 paddlers and daily port fees.

Yucatan: 3 honey = 1 salt, 54 honey = obsidian, 60 honey = jade
Belize: 5 honey = 1 salt, 30 honey = obsidian, 45 honey = jade
(Start 300 salt, trade 220 salt for 1100 honey pots in Belize, trade for 36 obsidian cores and have 20 honey left, back to Yucatan, trade 36 obsidian for 648 salt, or 1944 honey?)
Lower Level Students

- Basic math with Maya numbers (but only with numbers 1-10)
  Bar-and-dot numerals are by far the most common way the Maya represent numbers. A dot represents a one and a bar represents five. Usually the system's basic unit is 20, while ours is 10. For this exercise, you may want to stick with a base-10 system. A combination of dots and bars is used to represent numbers. Like most western number systems today, the Maya used place notation to express large numbers. Our number 1,492 has one 1000s (10^3 x 1), four 100s (10^2 x 4), nine 10s (10^1 x 9), and two 1s (10^0 x 2). We know the relative value of each number because of its position in relation to the other numbers: each unit is ten times larger than the one to its right. The Maya also had the concept of zero, a place-holder in a place-notation-based system, well before the western world. One bar, three dots is eight, no bars, and two dots is two, and so on. This was done with a flower-shaped glyph in the inscriptions and a conch shell in the codices.

- Teaching barter trade system:
  - This is a basic trading game where you can simulate barter trade in your classroom.
  - Have three desks become trade centers, where one or two students can run each center.
  - The rest of the students become traders.
  - Each trade center has different exchange rates:
    - Jade Center: 2 corn for 1 honey, 6 corn for 1 salt, 20 corn for 1 jade.
    - Salt Center: 3 corn for 1 honey, 3 corn for 1 salt, 30 corn for 1 jade.
    - Honey Center: 1 corn for 1 honey, 4 corn for 1 salt, 40 corn for 1 jade.
  - Have traders move around trading between centers. Each time they visit a trade center, they have to pay 1 salt in tax, which the trade center can use to gain wealth.
  - Each trader starts with 1 jade, 5 salt, 10 honey, and 20 corn.
  - Each
  - At the end, add up points with following scale:
    - 1 Jade = 30 pts
    - 1 Salt = 4 pts
    - 1 Honey = 2 pts
    - 1 Corn = 1 pt
Art:

Upper Level Students
- Discuss conventions of Maya, trying to overcome limitations of media.
- Try to copy and then reinvent or reinterpret Maya monument and/or style.

Lower Level Students
- Coloring monuments and pictures (many Maya monuments were likely painted).
- Discuss colors and their Maya names, use them to decorate monuments.
- Putting vessels back together.

References:
- Art
  - *Art of the Maya Scribe*, by Michael Coe and Justin Kerr.
  - *Maya Art and Architecture*, by Mary Ellen Miller.
- Epigraphy
  - *Chronicles of the Maya Kings and Queens*, by Simon Martin and Nikolai Grube.
  - *How to Read Maya Hieroglyphs*, by John Montgomery.
Match the Maya Hairstyles

Put a check mark under the one picture in each row that is most like the sample. Write the numbers of the pictures you chose and explain the basis on which you made your choice.

<table>
<thead>
<tr>
<th><strong>Sample</strong></th>
<th><strong>1</strong></th>
<th><strong>2</strong></th>
<th><strong>3</strong></th>
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<td><img src="image" alt="God K" /></td>
<td><img src="image" alt="Sample Picture" /></td>
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<td><img src="image" alt="Lord Pacal" /></td>
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<td><img src="image" alt="Lady Ahpo-Hel" /></td>
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<td><img src="image" alt="Chan-Bahlum" /></td>
<td><img src="image" alt="Sample Picture" /></td>
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1 All drawings by Marie Greene Robertson. Reprinted with permission.
Maya Hair Days at Palenque

There are many basic hairstyles portrayed by the pre-Columbian artists of Palenque. Most of the styles of both men and women were at times enhanced with ribbons, beads, tiny gods, flowers, feathers, animal skins, combs, stuffed rolls of cloth, and horns. Study the illustrations given below. Pick five hair styles to write about. Make up a name for the hairstyles and describe how they were created.

1. _______  2. _______  3. _______  4. _______  5. _______

7. _______  8. _______  9. _______  10. _______
Materials:

cutting wire, 25 lb. bricks of low-fire red clay (cut into 2 lb. sections), 2 dry paper towels per student (to "dry clean" their hands before going to the restroom), one newspaper section per student, plastic and a box to transport the finished projects back to the school.

Activity:

1. The students had an opportunity to become familiar with the collection first by tour and by drawing. The students had a 15-minute tour, then spent about thirty minutes drawing in the gallery before receiving the clay. Before the tour, assign the students the problem of copying something in clay that had been sculptured in stone or clay by the Maya.
2. Prepare the materials. Divide up the clay, towels, and newspapers.
3. Students may be creative, not only in their selections, but in how they go about reproducing the things they see. It is possible to let the students work with the clay simply to understand the process and the art work before them. What they make in clay can be photographed, and does not necessarily have to be made with score-and-slip techniques for kiln survival. It is okay to let the students use clay to reflect upon, interpret, and critically assess the characteristics, qualities, processes, and merits of the work of the Maya without preservation of their clay reflections. Use a video camera to develop an electronic portfolio for student assessment later.

Two examples of creative interpretation include the work of students Christopher and Jennifer, who chose a pair of ancient Maya clay birds to copy. Jennifer chose to copy the birds as closely to the original as possible, puffing up the breasts of the birds. Christopher creatively reversed the chests and made them concave. It was a rewarding morning for all.

(Left) To begin her relief, Andrea knelt by the cast monument and flattened the clay on the newspaper. (Center) Sergio worked at a distance to make a copy of the face of the Lord on this cast of a tall stela. (Top right) He captured the look of a prominent nose and protruding lips. Sergio Veldquez, age 12, 7th-8th grade, Hilltop Middle School, Sweetwater Union High School District, Chula Vista, California. (Bottom right) Andrea was impressed with the decorative apron worn by the ruler on this cast of a stela. This is her relief in clay of the apron. Andrea Medina-Smith, age 11, 6th grade, School of Creative and Performing Arts, San Diego Unified, San Diego, California.
Maya Glyph Sort

All the Maya glyphs pictured here appear on sculpture. With a partner, cut out the images, create categories for the glyphs, then sort the images into those categories. Hand letter or word process the titles of the categories you and your partner created. Attractively arrange the glyphs on a chart to display for others. To learn how to categorize glyphs you might want to study the work of Sir Alan Gardner, who made a sign list for another ancient civilization. His list of Egyptian Hieroglyphs had some 750 signs.¹ His categories included, among other things, "unclassified shapes," "parts of the human body," "parts of mammals," and "parts of birds." You might use these categories, or create your own. For example, your categories might include all shapes that have "profiles of human faces" or all glyphs with "concentric circle forms."²

² All glyphs were drawn by Linda Schele and Ian Graham. Reprinted with permission of the artists
More Maya Glyphs (Clip Art) for Young Epigraphers
List the Details (in both drawings)\(^1\)
- Enumere los detalles (en ambos dibujos)\(^2\)

Write A Short Description
- Describa los dibujos brevemente

\(^1\)Reproduced with permission of the artist Matthew G. Looper
\(^2\)Reproducidos con el consentimiento del artista Matthew G. Looper
List the Details (in both drawings)¹
- Enumere los detalles (en ambos dibujos)²

Write A Short Description
- Describa los dibujos brevemente

¹Reproduced with permission of the artist Matthew G. Looper
²Reproducción con el consentimiento del artista Matthew G. Looper
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\textsuperscript{1}Reproduced with permission of the artist Matthew G. Looper
\textsuperscript{2}Reproducidos con el consentimiento del artista Matthew G. Looper
Whistles from Jaina

Whistles from Jaina have been known to have multiple chambers with a single airduct assembly. The advantage of such a whistle is that it has more than one pitch. To accomplish this, the following must happen: there must be two whistles of a similar size with their apertures placed directly opposite each other, surrounded by a third open chamber. When the performer blows through the airduct, one chamber is activated. When the performer blows harder, the sound jumps to another pitch. The pitch can be lowered, within limits, by decreasing the open area of the surrounding chamber with the hand or fingers.\(^1\)

The clay whistle of a standing figure with tall hat has an airduct at the base, behind the legs, while the cross-legged woman has what appears to be an airduct in the part of her hair-do. The pottery effigy whistle/rattle in the form of a ball player from Jaina in the San Diego Museum of Man has a square vent hole and small slit mouthpiece on the reverse of the right arm. The seated female figure whistle from Jaina in the San Diego Museum of Man has a short stubby mouthpiece at the base with a rectangular vent hole above.


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Textiles: Backstrap Weaving

Textiles were, and are, an important part of the Maya culture. By the time girls are twelve or thirteen they are skilled weavers. They may begin by weaving a small horizontal band or a few horizontal rows, but in most places they learn quickly to weave *huipils*, the main article woven on backstrap looms.¹

Raw Materials
Cotton is indigenous to the area and was the favored plant fiber for weaving. They also weave with maguey for straps and bags, never for clothing. Wool is a favorite fiber in the highlands. Women use the backstrap to weave *huipils*, sashes, and skirts, and men use foot looms to weave the skirts or articles of clothing called *delantera*, worn around their hips.²

Spinning
It takes two pounds of wool to weave a *delantera*. A weaver can spin one pound of black wool and one pound of white wool, or a combination of the two to get gray wool. To get a fine thread a spindle is used. Spindles for cotton are straight, slender sticks, about 15 inches long. They have pointed ends and a clay whorl a few inches above the lower end. It takes about 15 seconds to spin and wind 35 inches of yarn.³

Dyes
Since the conquest, yarns have been dyed. Blue and red are the favorite colors. A garment such as the *huipil* woven in the traditional style will have dark blue geometric patterns set against a red ground.⁴ In Mesoamerica, the plant from which indigo for the blue is extracted is *Anil (Indigofera*
suffruticosa). It is reduced in a vat with the sacatinta plant (Jacobinia spicifera). The ground indigo and the green leaves and stalks (and today some synthetic dyes) are steeped in a vat. After a few weeks the mixture will ferment and the dyer will strain the liquid and be ready to use the dye. A different process is used for red dye. Red comes from an insect: cochineal (Dactylopius coccus). The insect is "planted" on Nopal cactus. A whole plantation of insects can be harvested from one cactus. It takes 2-6 ounces of cochineal to one pound of wool for the dye bath. That's about 12 ounces for a delaniera.

Weaving

Warping Frame
To prepare the yarn for the loom, the weaver drives about three sticks into the ground for a measure. The distance from the first to last warping peg is equal to the length of the warps when they are placed on the loom. When the warping is done, the fibers are sized in a solution of corn dough dissolved in hot-water. Sizing makes the warp stiffer, stronger, and smoother. Sometimes the sizing process causes the warp to shrink. The next step is dressing the loom.

The Loom
The backstrap loom is made from a few sticks, a rope, a backstrap, and string. When not in use, it can be rolled up and stored easily.

Rope. The rope is used to attach the loom to a stationary object. Tie the rope so that both ends of it are the same length, and the upper end bar is horizontal or parallel to the ground.

End bars. Attach the warp yarns to the end bars. When weaving the warp must be under tension. The weaver regulates the tension of the warp by leaning forward or backward. End bars usually vary according to what is to be woven: skirts (38"), huipils (32"), and belts (18").

Backstrap. Most backstraps are made from maguey-fiber cord or occasionally from leather. The weaver places this strap behind her back.

Shed roll. The shed roll is cylindrical and separates the warp threads. They are made of bamboo or other light wood.

Heddle. The heddle is cylindrical and changes the shed on the loom. By lifting the heddle stick, the heddle-controlled warps are raised above the warps that pass over the shed roll.

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**Batten.** A batten made for weaving huipils might be made from light wood like pine about 36" long and 2" wide. They are used to open the shed so the bobbin of weft thread can pass, and to batten down the weft onto the cloth or web.

**Bobbin.** Most bobbins are simple sticks used to carry the weft yarn through the shed. In some communities where the weft is hand-spun, the spindle is used as a bobbin. Pointed sticks with slits and reed bobbins with forked ends have also been used.

**Process:**
The basic steps of backstrap weaving are: 1) establish shed 2, 2) put a weft into shed 2, 3) batten down the weft, 4) establish shed 1, 5) put weft into shed 1, and 6) batten down the weft, and return to step 1 again.

**The Fabric:**
Since very few examples of pre-Columbian Maya clothing exist, one of the best sources for studying pre-Columbian Maya textiles is clay figurines. When studying these figurines, scholars can study the front, back, and base of each costume. There are at least five categories of costume: draped, slip-on, open-sewn, closed-sewn, and fitted. Only the closed-sewn will be discussed here: a garment that is closed on the sides to form a sack, with openings for the head and arms. The woman's *huipil* and the man's tunic or sleeveless shirt are this type. They are constructed from one to three webs of cloth to make a rectangle.

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The Maya Style

The Maya style can be seen on sculpture and painting as "predominately linear, expressive, and descriptive, based in naturalism, and using overlapping forms in densely packed compositions."¹ One of the first places where this is seen is in the text on their art forms. A pattern of rectangular-like glyphs are used by the Maya artists on almost everything. The glyphs pictured below were carved on a stone monument.

![Glyphs on Monument 2 at Quiriguá](image)

Drawings of glyphs on Monument 2 at Quiriguá reprinted through the courtesy of the artist Mathew Looper.

**Densely Packed Compositions**

Note the way the Maya packed some of their compositions with people, animals, objects, and parts of each, in composite and hopelessly interlocked ways. The use of overlapping is unique in pre-Columbian art. Other cultures placed shapes next to one another.²

**Linear**

Perhaps one easy way to describe the Maya painting style, as seen in vase painting, is that it is a "coloring book" style. Naturalistic-looking and abstract objects are usually painted with dark visible outlines, and filled in with solid colors. The lines are consistently thin with the same thickness throughout a composition. The Maya artist also liked naturalistic detail.

**Narrative**

In the western areas of the land occupied by the Maya, in the areas of Yaxchilán, Jaina, and Bonampak, the Maya created a narrative style in context with their architecture and vase painting. Narrative means the image appears to be one moment from a series of related actions—a moment carefully chosen to evoke the entire story. Sometimes a single figure is represented this way and other times two or more figures are depicted interacting in a variety of mundane, historical, or mythical events. These are unique events.


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