5.1 Describe how resources and technology contributed to the emergence of the city-state such as Cuello, Cerros, Lamanai and Colhá in the Pre-Class Classic period.

Natural and other resources such as fertile land, forest timber resources, forest fruits and edible herbs and medicines, marketable products like cacao and honey, aquatic animals, wet lands, water including rainfall, flint (chert), waterways to facilitate communication and transportation were factors that influenced the development of settlements. Applied to these resources, Maya technology produced products and services that contributed to development, from hamlets to villages to towns and cities. In the mid-Pre Classic (from about 1200 B.C.), Cuello remained a small settlement and Cerros disappeared by the end of the Pre Classic (ca. 250 A.D.) while Lamanai and Colha continued to develop and reached their peak of development in the Classic and Post Classic respectively. What explains the continuity of Lamanai and Colha and the abandonment of Cerros in the Pre Classic?

Objectives for 5.1

Students will

5.1.1 Identify major geographical features of the Maya area including the sites under study.

5.1.2 Draw inferences from the availability of natural and other resources (fertile land, wet lands, forests, special stones (flint), water, rivers, coast, etc.) to explain the use of Pre Classic Maya technology and its relationship to settlement growth and continuity.

5.1.3 Outline the main production tools and techniques used by the Pre Classic Maya such as those from Cuello, Cerros, Colha and Lamanai.

5.1.4 Describe the water management system at Cerros or the “harvesting” of aquatic animals at Cuello in the Pre Classic.

   Explain the uses of the water management at Cerros.
Activities for 5.1

5.1.1 In a blank physical map of the ancient Maya world, colour the map using colour codes to identify altitude, vegetation, rivers, lagoons and the Belize settlements of Cuello, Cerros, Lamanai, Xunantunich, Oxwitzjá (Caracol), Colhá, Nim Li Punit, Pusilhá and Colhá.


5.1.2 Based on any one of the following authors (Pulestone, Fradkin & Carr, Macrae & Iannone, Hester & Shafer and Kosakowsky), how did any one of the following (ramon nuts, aquatic animals, agriculture terracing, flint (chert) and ceramics) supported the development of Pre Classic Maya settlements such as Cuello, Cerros, Lamanai and Oxwitzjá (Caracol)?


5.1.3 Based on V. Scarborough, draw a model of the water management system developed at Cerros.


Based on James O’kon (see attached), select one tool and in a small group (up to five persons), use the tool and technique to develop one Maya product.

5.1.4 Based on V. Scarborough and Chase & Weishampel (see above), use a table to explain the applications of Cerros’ or Oxwitzjá (Caracol)’s water management system to address Maya needs such as intensive agriculture, drainage, access to water in the dry, fish farming and local transportation.

5.2 Explain the regional political and economic significance of Oxwitzjá (Caracol) and Lamanai in the Classic period.

As case studies, Oxwitzjá (Caracol) may be a good example of a Maya regional state while Lamanai may be an example of a city-state. Factors such as natural resources, agriculture, trade, religion, political alliances, warfare, architecture and control of certain high value goods in demand by elites from other regions help explain the development, dominance and continuity of Oxwitzjá (Caracol) and Lamanai. Relationships between regional states and city-states were also important. Major models of political organization have been proposed based on the archaeological record, particularly Maya epigraphy. Both Oxwitzjá (Caracol) and Lamanai went into a steep decline in the Terminal period but Lamanai survived though in a much less glamorous into the historic period with the coming of the Spaniards.

Objectives for 5.2

Students will

5.2.1 Identify the regional state of Oxwitzjá (Caracol), the city-state of Lamanai and their respective satellite settlements.

5.2.2 Briefly explain three ways in which religion supported state formation in the Maya Classic.

5.2.3 Outline the argument for the existence of regional states such as Tikal, Calakmul, Naranjo and Oxwitzjá (Caracol) based on epigraphy (deciphered Maya writing) and the archaeological record.

5.2.4 What economic factors such as forestry, trade and agriculture contributed to the development of Oxwitzjá (Caracol) and the longevity of Lamanai?

Activities for 5.2

5.2.1 See attached map. Map work to come up with district (localized) maps of the regional state of Oxwitzjá (Caracol) and the city-state of Lamanai. Suggest the
probable geographical reasons why Oxwitzjá (Caracol) became a regional state and geographical reasons why Lamanai became a stable city-state.

Link to Chase et al. The Use of LiDAR in understanding the Ancient Maya Landscape, [Oxwitzjá Caracol and Western Belize,” Advances in Archaeological Practice: A Journal of the Society for American Archaeology, August 2014, 208-221.

5.2.2 Compare the Classic Maya state and the present day Belize state. State three ways in which religion contributed to the development of the Classic Maya state and three ways in which religion supports the Belize state today.


Lisa J. Lucero, “The Emergence of Classic Maya Rulers,” Current Anthropology. Vol. 44, No. 4, August –October 2003, pp.523-558. (Search on line, as I could not download this article.)

5.2.3 Divide the class into four groups to address the following question. What evidence is there to support the view that Oxwitzjá (Caracol) was a regional state?


5.2.4 In what ways did agriculture, forestry and trade contribute to the development of Oxwitzjá (Caracol) and the longevity of Lamanai?

Link up to David Lentz et al, “Agroforestry and Ritual at the Ancient Maya Centre of Lamanai,” 1 - 41. Downloaded from
5.3 Describe the ways in which Maya civilization in Belize both changed and remained the same after the end of the Classic Period.

Recent archaeological research has challenged the traditional division of Maya Civilization into Pre Classic, Classic and Post Classic. For example, some archaeologists have identified many of the features previously thought as characteristic of the Classic by the Middle and Late Pre Classic. Similarly, some archaeologists such as Arlen and Diane Chase are making a similar argument for the transition between the Classic, Post Classic and even the historical period (post 1520s). Overall, in respect to lowland Maya cities there were three possible scenarios. Many Classic Maya cities such as Altun Ha were rather abruptly abandoned (collapse) in the terminal Classic (800-900 A.D.) while others saw a gradual weakening (crumbling) before abandonment that may have lasted for about as much as two centuries. On the other hand, there were cities such as Lamanai that were not abandoned up to today. Surely, there were changes in monumental construction, writing and social structure (such as the prevalence of the royal elite) but the majority of the people who were commoners (yalbauicob) very likely continued to practice many of their traditions and practices. For example, the Tipu census of 1654 revealed several Maya of Belize that were using the Maya calendar to arrive at their first name much like what obtained in the Classic and Post Classic periods. The rituals associated with use of the land, beliefs about the lords of the forest and the dead have persisted in mutated and not so mutated forms even to the present.

Objectives for 5.3

Students will

5.3.1 Outline the variations in the transition among Belize Maya cities from the Classic to the Post Classic.
5.3.2 Explain in respect to any specified cultural practice or tradition (such as religion, burial practices, rituals associate with the use of the land), changes and continuities from Classic to Post Classic to historic times.

Activities for 5.3

5.3.1 For each of the following scenarios, chose one Belize Maya city to explain the idea of the transition from Classic to Post Classic to continuity in historic times: a) sudden abandonment, b) slow decline and c) continuity to the historic period.


5.3.2 From the archaeological and ethno historical record, identify three cultural practices that continued from Classic to Post Classic times. Then interview a resource person or conduct an internet search to find out to what extent is the tradition still practiced in Belize today. (Where, by whom, how, what changes can you perceive?)


5.4 Investigate in depth and with reference to archaeological evidence, one aspect of ancient Maya Civilization in Belize.

There are many aspects of Maya Civilization in Belize. Quite often a senior archaeologist may obtain funding for a program of research at a given area as a head of an interdisciplinary team for one or a series of research “seasons”. While the “whole is bigger than the sum of its parts”, Mayanists who specialize in a sub-discipline of Maya archaeology tend to focus mainly in their area of specialty. For example, there are archaeologists who deal mostly with ceramics, tools, architecture, ecological issues, water and
its management, calendar and astronomy, epigraphy, subsistence, political organization, religion, trade, warfare, and so on. Then there are Mayanists who tend to focus on the traditional periods of Pre Classic, Classic or Post Classic while others focus on one or a few Maya sites such as Tikal, Oxwitzjá (Caracol), Altun Ha, Lamanai, Santa Rita, etc.

This objective requires students to choose one aspect as a module that would involve a more in depth-treatment of the topic. For example, a student may choose to study topics such as warfare, Maya kingship, monumental architecture, agriculture, mathematics, calendar, trade, religion, and pottery/ceramics, and so on. Another approach might be to study a site such as Lamanai or Santa Rita, for example, as it transitioned from Post Classic to historic times or Altun Ha in the Classic or Cuello in the Mid Pre Classic. A team approach might be to take a regional state such as Oxwitzjá (Caracol), assign sub-topics to members of the team to assemble a more comprehensive treatment of the site. A presentation might take the form of a video or a combination of video and power point.

It is important that the teachers prepare a guide including a rubric to explain thoroughly what he/she expects students to do in this assignment. Check the internet for a general guide that you can adapt to your needs. The following link is an example of where you can get a general guide that you would then need to adapt. Alternatively, you may wish to start from scratch. I have a guide that I developed for history research papers that you can look at as another sample. 

Sample sources for 5.4


Mark Pitts, Maya Numbers and the Maya Calendar: A Non-technical Introduction to Maya Glyphs, Manuscript, 2009.


5.5 Identify the main techniques used by archaeologists to investigate ancient Maya civilization.

Archaeology is understood as the study of the past through its material remains. The discipline aims to reconstruct the past through an understanding of the function and meaning of material remains of those who used them. Archaeologists use the scientific method to test hypotheses (or tentative answers to questions posed) in reconstructing the past. They gather, organize, analyse and interpret data that may support the hypothesis as stated or modified in light of the evidence.

Archaeologists gather data such as artefacts (portable human made or modified object), features (non-portable human made or modified objects such as a temple, terraced hill), eco-facts (natural remains that have not been human made such as human hair, bones), sites (classified under location, use, age, cultural affiliation) and region (for locating sites).

For dating, the most common method is carbon 14 dating. Relative dating methods include stratification where the assumption is that in a given test pit, sediment accumulates over materials and those found in the deepest levels are the oldest. Seriation is another relative method where artefacts whose manufacture or approximate date, form or use is known are associated with artefacts in need of dating. For example, pots of a certain type form or function might have been carbon dated within a time range. The Maya calendar and Maya deciphered epigraphy have yielded reliable dates in the corresponding modern calendar. The interpretation of the evidence from the archaeological record makes the important assumption that cultures develop in diversified ways influenced by their corresponding physical, social, political and biological environments. Depending on the culture(s) studied, allied disciplines of geology, botany, ecology, hydrology, ethno history and historical archaeology are relied upon to address questions that require the tools of enquiry of those disciplines.

Maya archaeology in Belize has many more questions than answers. Moreover, Belize still needs to develop a corps of Belizean archaeologists who may join colleagues from other countries in addressing the challenge of reconstructing the past from about 1500 B.C. to historic times even while the evidence is preserved for the use and enjoyment of generations to come.

5.5 Objectives

Students will
5.5.1 Recall the main elements of how archaeologists investigate an archaeological question.

5.5.2 Explain the main ideas behind Carbon 14 dating.

5.5.3 Apply the Maya Long Count Calendar formula to find the equivalent in the Gregorian calendar of a date in the Classic Maya period.

5.5.4 Outline the main ideas of Ethno and historical archaeology.

5.5 Activities

5.5.1 Divide the class into groups of no more than five students.

Scenario: Date, 25 November 2322. At the now abandoned Maya village of Crique Sarco, your team dug a trench five feet deep. At level 5 (five feet), you found a $1. Belize coin. Beside it, you found a golden ring. At level 4 (four feet) you found a (Belize) Social Security card with the name, Tuguch Chiac, born 8 August 1999. At level 3 (three feet), you found the skeleton of a cat. At level 2 (two feet), you found the remains of an unwashed cooking pot. At level 1 (one foot), you found a cell phone, made in Taiwan.

Answer the following questions.

1. What is the approximate age of the golden ring?
2. Make a list of inferences based on the material remains that you found. Classify the inferences as most likely to be true and most likely to be false based on what you know of the present day Maya who live in Crique Sarco.
3. Write one paragraph describing the people who lived in Crique Sarco in 2018 based on your team’s interpretation of the materials found in the test pit at all levels.

5.5.2 Do a search on radiocarbon 14 dating in the internet.

1. Outline the main ideas about radiocarbon dating.
2. How accurate is this method in dating Maya artefacts?
3. What are the limitations of using this dating method?

Link to https://www.radiocarbon.com/about-carbon-dating.htm How does Carbon Dating Work?


In groups of up to five students, write your birthday in the Maya Long Count Calendar.
5.5.4


Read Pendergast, “Worlds in Collision” and “Stability through Change.” Briefly explain how historical archaeology helped to reconstruct the 16th and 17th century histories of either Lamanai or Tipu.

BELIEFS

ORIGIN STORIES

6.1 Compare how various ancient civilizations explained the origins and development of the universe, the earth, life and early technologies.

Human beings are introspective creatures. We reflect on questions such as, Where did humans come from? Who created us? What is the purpose of our being on earth? All civilizations have come up with answers to these questions. In some cases, the answers were/are embedded in religion as body of knowledge and wisdom that provides answers to these deep philosophical questions. Christians, for example, turn to the Bible to provide answer to these questions. Creation stories have some elements in common but others are very different.

Objectives for 6.1

Students will

6.1.1 Describe in one paragraph their understanding of creation stories.

6.1.2 Outline at least one creation story from Africa, one from Asia and one from ancient America.

6.1.3 Compare and contrast a select number of creation stories.

Activities for 6.1

6.1.1 Consult the internet or the link below to arrive at your definition of creation stories. What are they, why have civilizations found it necessary to have one, what do the stories tell us about the civilization itself.
6.1.2 Consult the internet or the link above for information. Outline the main ideas about one creation story from each of the following areas.

1. Ancient America (except the Maya)
2. Ancient Africa
3. Ancient Asia
4. Ancient Europe

6.1.3 Consult the internet or the link above for information. Construct a Table in which to organize the following information for the four Creation stories outlined in 6.1.2.

<table>
<thead>
<tr>
<th>Continent</th>
<th>Specific Civilization</th>
<th>Common Elements of the Creation Story</th>
<th>Unique Elements of the Creation Study</th>
<th>Comments</th>
</tr>
</thead>
</table>

6.2 Communicate an ancient creation narrative in an original way using modern technology.
5.2.1 Map of Oxwitzjá (Caracol) as a regional site, with neighbouring sites.
5.2.3 Maya technology

The technological advances of Maya engineers have been investigated by Jim O'Kon for forty years. His research has included a wide variety of technical developments of the Maya. We invite you to visit this website to review the unique technological/engineering achievements of the Maya engineers. These technological achievements include the fabrication of tools that are harder than iron; the invention of high strength durable materials of construction including the fabrication of hydraulic cement for producing cast-in-place concrete; the development of the Maya arch as a structural mechanism to create multi-story and clear span structures, elevated concrete paved roads; long-span bridges, and advanced water management methodologies that permitted the Maya urban civilization to survive in a seasonal desert environment.

Archaeologists consider the Maya to be a Stone Age Culture. They continue to focus on this cultural label because the Maya did not use tools of iron or bronze. Their use of specialized jade tools, which are harder than iron, should provide a positive rationale to provide a new nomenclature based on their technological achievements. The Maya should be given a new nomenclature: TECHNOLITHIC.

We invite you to assess this website and develop your own conclusions relative to the technological capabilities of the Maya as Americas first Civil Engineers and their status in the pantheon of human civilization.

Transport

At the end of the Pleistocene Era, North America was populated with a wide variety of animals that have now become extinct. The northern group of
these animals, the *equus*, or modern horse, and the *camelus*, the modern camel, migrated to Asia where they became domesticated and supplied the power and transportation for all the great civilizations of Asia, Africa and Europe. The southern herds remained in North America and were victims of mass extinction at the end of the last ice age. Humans migrating to the continent did not find candidates for beasts of burden until they encountered llama or vicuna, all the way down in South America. When next seen in the Maya zone, the horse had a Spanish Conquistador on its back.

**Read more: Transport**

**TOOLS**

The Maya civilization did not have the advantage of an available source of iron ore. In Mexico iron ore only is found over 1000 miles to the north in the state of Colima. Archaeologists have determined that the Maya used stone tools fabricated from chert and obsidian. They have overlooked the wide use of specialized tools fabricated from black jadeite. In lieu of the advantage offered by iron tools, Maya technicians discovered the advantage of jadeite as a material for making tools. The size and shape of the Maya tools are identical to the variety of steel tools used by modern artisans working in stone and wood.

These jadeite tools were the principal tools used by Maya technicians: sculptors, stonecutters, wood carvers, and other artisans.
These tools include various sizes and shapes of chisels, gouges, adzes, axes, and hoes.

Jadeite is a very tough mineral with a great resistance to breakage due to the intergrowth of prismatic crystals in its matrix. The green jade that is most popularly used in jewelry is sodium aluminum silicate. However, in “black jade”, the replacement of the AL (Aluminum) by Fe+3 (Iron) produces an isomorph of jadeite, an iron rich jadeite called chloromelanite. Chloromelanite is green/black in color and is referred to as "black jade." Jadeite is formed in few locations in the world. The tectonic plate in the Montagua Valley of Guatemala produces the jadeite the Maya used.

Jadeite is a very hard and durable material. On the Mohs scale of mineral hardness, where the maximum hardness is number 10.0 for a diamond, a steel knife blade has the hardness of 5.0; jadeite has a hardness number of 6.5 to 7.0. The Mohs scale indicates that the jadeite material from which Maya tools were fabricated is harder than iron or steel. Thus, the Maya tool making technology elevated the society out of the "Stone Age" and beyond the "Iron Age."

Examples of jadeite tools are not found in royal tombs. These tools belonged to the artisans and not the elite and they would have been passed down through families of artisans as would the techniques for producing them. They will not be found by archaeologists in contexts similar to other artifacts because they were not used or prized by the Maya elite.

Obsidian is a volcanic glass that is sourced in the ring of volcanos along the Pacific Coast of the Maya area. Maya technicians developed techniques for producing cutting blades that can be the sharpest on earth. The sharpened edge of an obsidian blade approaches molecular thinness. This Maya tool
material is used for producing scalpels for heart and eye surgery in modern medicine.
The Maya city of Yaxchilan is sited within a giant omega of the Usumacinta River. This circular bend in the river developed a 3.2 kilometer wide land mass within the inner curve of the river. This protected area, formed within the confines of the inner curve of the river, created a natural fortress for the city. However, the river is in a flood state for six months of the year, and during the rainy season the broad and swiftly flowing waters isolated the city from access to its domain across the river.

In order to survive as a viable urban center, this ancient city required a dependable year-round way to cross the river. While the site had been studied by archaeologists since 1882, the need for a bridge crossing was not considered as a necessity by archaeological studies. The ancient ruins that were the clues to the existence of this lost landmark of Maya Engineering were hiding in plain sight (see picture on right). The need for a permanent lifeline to insure the survival of the city during the flood season was overlooked by archaeologists until James O'Kon carried out a series of expeditions, forensic engineering investigations, archaeo-engineering analysis, remote sensing, and computer modeling of this
structure lead to the digital re-construction of the bridge. Constructed in the late 7th century, landmark three-span suspension bridge crossed from the city center over the Usumacinta River to the north side where the villages and farms were located.

The rendering of the bridge indicates its design that supported the deck from shore to shore. The two tall bridge piers were located in the river with abutments on each bank. The geometry of the bridge extended 113 meters in three spans from the grand plaza of the city to the northern shore; the center span was 63 meters long.
The bridge construction consisted of a wooden deck suspended from rope cables made from henequen, a common Maya construction material. The cables spanned between cast-in-place concrete and stone towers topped by a Maya arch. The three-span bridge structure was elevated 22 meters above the river at low water levels. The height of the deck was established by the elevation of the approach structure, Structure 5, on the Grand Plaza. This elevation maintained the bridge deck well above the 15-meter high water level reached by the wild river during the flood season.
The bridge is considered to be the longest bridge in the ancient world until this record was broken by Italian engineers constructed a longer span in 1377. The discovery of the bridge was published in Civil Engineering Magazine and in National Geographic Magazine. The History Channel produced a video with an account of this unique feat of Maya engineering.
Medium span bridge structures

Maya engineers constructed numerous bridges with spans up to 50 feet long with timber beams. This figure shows a cross section of the Classic Period Maya bridge over the Pusilha River.

Short span bridges

Maya short span bridges crossed streams, canals and moats in urban environments. Figure xx indicates a Maya bridge over the Otulum River at Palenque and the figure to the right shows the Maya bridge over the moat surrounding the city of Becan.
Maya engineers developed a unique structural mechanism that enabled the construction of long span interior spaces, multi-story structures and unique circular structural geometries. This structural mechanism is known as the Maya arch. This is the basic building module for all Maya structures. The structural geometry of this system utilizes a linear inverted "V" shape to develop clear span interior spaces.

Read more: MAYA ARCH

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The Maya invention of hydraulic cement and the construction of cast in place concrete structures enabled the Maya to build their great high-rise cities. This durable material enabled the structures to withstand the ravages of time and the environment. They resisted the forces of earthquakes, hurricanes, and prying jungle growth to enable their survival after 2000 years. The grand buildings towering over the rainforest, the infrastructure of the large cities, water reservoirs, paved roads and long span bridges were made possible through the use of cast in place concrete in unique structures constructed by creative Maya engineers.

Read more: CEMENT

AGRICULTURE

A major part of the natural environment of Yucatán is a paucity of rain for six months a year and a thin layer of soil that was insufficient for supporting agriculture using traditional methods. To feed the growing population Maya technology combined agricultural technology with water management to enhance the yield of their agriculture, a yield that satisfied the needs of the population with a surplus for trade. The Maya had a wide variety of cultivars; many of which constitute our basic agriculture products sold
in modern super markets. Maya agricultural products include corn, squash, beans, tomatoes chili peppers, avocado, papaya, pumpkin, sweet potatoes, vanilla, peanuts pineapple, chocolate, vanilla, cinnamon and many others. They developed creative methodologies to enhance the agricultural yield included raised field methods and terraced fields.

Read more: AGRICULTURE

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Water Management

The homeland of the Maya civilization was mainly in the Yucatán Peninsula. This tropical peninsula is controlled by a fickle and difficult natural environment. Geologically the landmass of the Yucatán Peninsula is porous karstic limestone platform covered with a thin layer of soil. Meteorologically, the environment is a seasonal dessert with six months of torrential rain and six months of a drought-like dry season. Storm water falling on the ground surface is absorbed by the thin soil layer and flows into the porous limestone and into the aquifer resulting in the almost complete absence of surface water in the Yucatán.

Read more: Water Management

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SACBE

The well-worn trails between Maya city-states presented difficult traveling conditions. They were dark and deep within shadows of the rainforest, with treacherous, slippery slopes and tangled jungle roots. During the rainy season travel was impossible. To solve the problems of traveling between city-states the Maya developed an engineering solution.

Maya engineers constructed broad concrete paved roads elevated above the tangled, flooded jungle floor. These elevated roadways or “sacbeob” enabled Maya commerce, governmental and military activities to travel between cities during all seasons of the year and on a 24-hour basis. The rough
tangled jungle trails were flooded for six months a year and the elevated paved roads were the solution for the efficient and transport of personnel and material between cities.

The construction of the sacbeob or "white roads" featured a design that was superior to Roman roads and paralleled our modern highway system. The sacbeob were constructed in widths up to 10 meters and paved with white cast-in-place concrete pavement. The pavement was elevated from one meter to three meters above the jungle floor. The roads featured traffic intersections, drainage features and rest stops complete with water supply.
The most prominent sacbe explored by archaeologists lies between the Maya cities of Cobá and Yaxuna. This road extends for 100 kilometers in an east/west line. This sacbe was surveyed by the Carnegie Institution in 1934 and a survey was carried out by James A. O'Kon, P.E. in 1995, 2001, and 2002. The initial survey by the Carnegie Institution was carried out using a magnetic compass. The O'Kon survey utilized satellite and remote sensing, aerial photography and ground based GPS studies. The O'Kon expedition confirmed the design and configuration of the classic sacbe.
The Maya economy depended on trading partners, not only in Mesoamerica but across the shining seas that border the Yucatan Peninsula. Large Maya seagoing vessels plied the open seas and ventured across the Caribbean to the islands extending from Cuba to Antigua. Maya sea traders traveled afar and encountered trading partners with valuable resources that could be traded for products unique to the Maya world.