



General Certificate of Education
Advanced Level Examination
June 2014

Critical Thinking

CRIT3

Unit 3 Beliefs, Claims and Arguments

Insert

Source Material

This source material is to be read in conjunction with questions in Unit CRIT3

A

There are no sources printed on this page

Native America and the Wheel

Document A

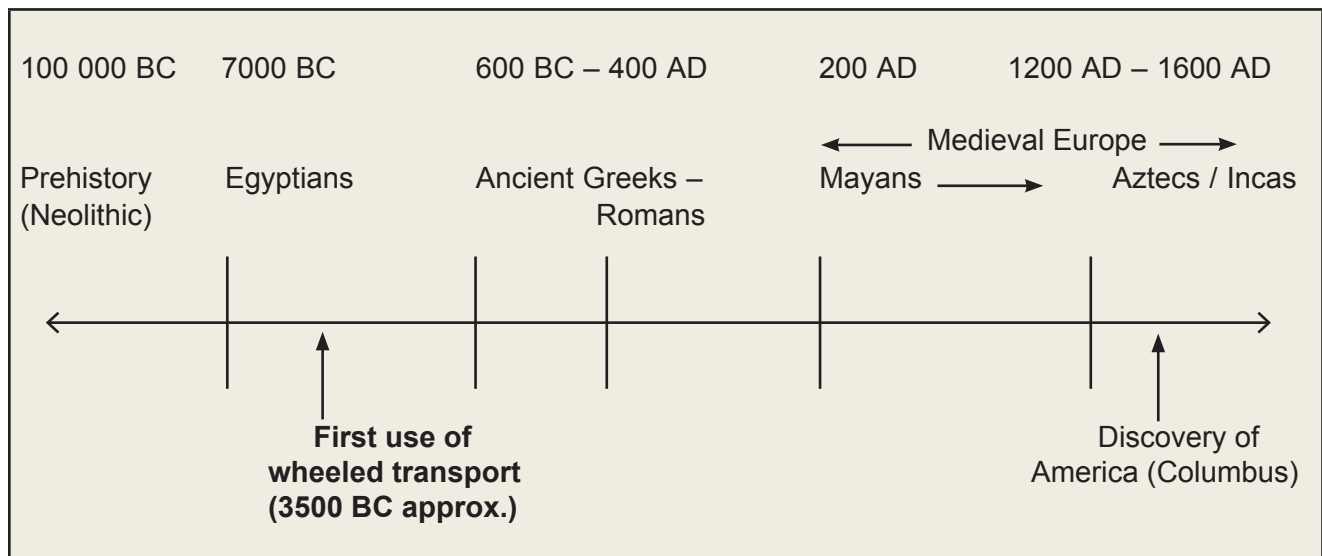
Background

1. Native American civilisations are difficult to arrange chronologically. The three best-known civilisations (Maya, Aztec, and Inca) are contemporaneous with Medieval Europe (Figure 2).
2. The Native American civilisations (Figure 1) are unique in that they developed in isolation from the other great world civilisations. Elsewhere, civilisations had extensive contacts – direct, or indirect, such as European contact with, for example, Arab and Chinese civilisations. Others had only minimal contact, but contact nevertheless.
3. The contact with the Europeans beginning in 1492 with Christopher Columbus was in many ways to Native Americans like visitors from outer space would seem to our modern world.

Figure 1: Native American civilisations



Figure 2: Timeline



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Document B

The problem

1. When we think of the great Native American civilisations – such as the Mayans, the Incas, and the Aztecs – we think of cultures that, in their own ways, were magnificently advanced – scientifically, artistically and architecturally.
2. Machu Picchu, in Peru, for example, or the Pyramid of the Sun, in Mexico (Figures 3 and 4), are often considered wonders of the world. Quite bizarrely, and despite these incredible achievements, there is absolutely no evidence that any of the Native American civilisations ever invented the wheel!

Figure 3: Machu Picchu, Peru (Inca)



Figure 4: Pyramid of the Sun, Mexico (Aztec)



Why it's thought the wheel wasn't invented by the Native Americans

3. The main reason for thinking this is simply the lack of actual positive evidence. With the exception of a number of small religious effigies, which clearly demonstrate a crude wheel-like structure (Figure 8), there is no evidence of wheel-like devices used at all – certainly not for their most obvious practical use: transport.
4. It is theoretically possible that the wheel was indeed used for transport, but as no physical evidence has yet been unearthed, this seems unlikely. Scholars agree that, unlikely as it may seem, the wheel as a means of transportation was simply never deployed in the Americas until the arrival of the European colonialists in the 16th and 17th centuries.
5. The other place you would expect to find the wheel used in early civilisations is in pottery. However, no Native American (pre-Columbian¹) pottery (Figure 5) was wheel-turned; it was made by building up from a rope-like roll of clay, which was later smoothed. In fact, it turns out that the potter's wheel arose around the same sort of time that wheeled transport did – around 3500 BC in Central Eurasia. Is it possible the two inventions are somehow connected – that you need one to have the other?

Figure 5: Pre-Columbian (non-wheeled pottery)



Figure 6: Greek (wheeled pottery) c.630 BC.



¹ period before discovery of America by Christopher Columbus

Figure 7: Early potter's wheels



A further twist

6. There is one further fact that makes the whole thing even more puzzling. While no evidence (in Native American Civilisations) of wheeled transport has been found, there have been numerous findings of miniature animal figurines that clearly display wheels (Figure 8). Originally thought to be toys, these are believed by many scholars to be religious effigies of some sort. Most appear to date from around the 9th or 10th century AD.
7. Some have used the fact of these findings to argue against the consensus view, maintaining that since the Native American civilisations were evidently aware of the wheel, they must have either chosen not to use it; or they used it, but no record remains. Others see this as simply making the problem more pronounced: how could they have been aware of the wheel and yet not got round to using it?

Source: written for AQA, 2013

Figure 8: Pre-Columbian wheeled figurine



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Document C

The lack of wheeled transport in Mesoamerica²

1. Why, given the existence of these wheeled effigies (Figure 8), did the indigenous American cultures never adopt the wheel as a practical transportation device? We might begin by turning the question around and asking why anyone ever adopted the wheel and under what circumstances? Humans managed perfectly well without wheeled transportation during most of prehistory; suggesting that only very special circumstances and conditions led to the development of the technology and organization necessary for the effective use of wheeled vehicles. What were these conditions?
2. Professor Stuart Piggott (Research: 1968; 1983) concludes that wheeled vehicles first appeared in Mesopotamia (modern-day Iraq) during the Uruk period, prior to the 3rd millennium BC, and at the same time or a little bit later in South Russian Pit Grave culture. Both areas were open grassland or semi-desert environments with few or no physical obstacles to vehicle travel.
3. In contrast, Mesoamerican topography was a basic obstacle. One writer has compared the area to a giant piece of crumpled paper sitting on a table top. The highland areas have rugged mountain ranges with steep gorges, broken topography, and small valleys; while the coastal lowlands are covered with tropical forests, swamps, and a complex network of waterways. Wheeled vehicles would have been unusable in both environments without roads, bridges, causeways and gradient modifications. Mesoamerican Indians were clearly capable of constructing such facilities; the Maya, Aztecs and other groups built many kilometres of roads and causeways – but only on flat terrain, never in the mountains.
4. However, it was the absence of draught animals which was the major obstacle. Wheeled vehicles laden with cargo offer no substantial advantages over human porters if they must be propelled by people, particularly over long distances and on sloping or broken terrain. This is especially true of the very heavy vehicles with solid wooden wheels and axles, the earliest type known in the Old World and logically the first types in the technological evolution of vehicles. Animal traction is essential.
5. Unfortunately, for ancient Mesoamericans, the largest domestic animals in their environment were medium-sized hairless dogs, *Xoloitzcuintli*, which were clearly unable to pull large vehicles. Further south, in the Andes, there were llamas and alpacas which might have pulled wheeled vehicles. However, since there is no evidence of wheeled figures in this region, it is likely the people of this area were unaware of the wheel.
6. Finally, with a transportation system efficient enough to suit their needs, there was no cause for innovation. Long before Mesoamerican Indians invented the wheel, they had developed a transportation system based on foot and canoe travel, a system which did not change substantially until the present century. Caravans of human porters, often slaves, trekked vast distances carrying goods on their backs. Water transportation was preferred wherever navigable lakes, rivers, and coastal waters allowed it. This transportation system was functioning at the time of the Spanish conquest, and the same modes of transport continued even after the Spaniards introduced wagons, carts, and draught animals. Native Americans preferred their traditional methods of transport until railways, buses, and trucks penetrated their homelands in the 20th century.

² Mesoamerica (see Figure 1) refers to a cultural and geographical region stretching across Central America to the edges of North and South America where most of the Early American civilisations were located.

7. Even with suitable draught animals, after European colonisation, Native Americans found the costs of adopting wheeled transportation too high and the benefits too few. This is not surprising. Human cultures are integrated wholes, and changes in one sphere frequently lead to major, and at times, damaging, changes in other aspects of life. In light of this, is it any wonder that pre-Columbian Native Americans ignored the practical application of the wheel?

Source: adapted from a scholarly article entitled 'Tula, and wheeled animal effigies in Mesoamerica' by Richard A. Diehl & Margaret D. Mandeville © Antiquity Publications Ltd, 1987
Foundation for the Advancement of Mesoamerican Studies, INC
www.famsi.org

Document D

Explanations for why the Native Americans did not invent the wheel invariably assume that the wheel is a relatively simple piece of technology – and that there must therefore be other inhibiting reasons, such as topography, or the range of indigenous animals at their disposal. But this is to ignore the fact that the wheel is actually a highly complex piece of engineering.

To make a fixed axle with revolving wheels, the ends of the axle have to be nearly perfectly smooth and round, as do the holes in the centre of the wheels; otherwise there would be too much friction for the wheels to turn. Furthermore, the axles have to fit snugly inside the wheels' holes, but not too snugly – they have to be free to rotate.

Far from being basic, the design is so ingenious that it took until 3500 BC for someone to invent them – by which time humans were already casting metal alloys, constructing canals and sailboats, and even designing complex musical instruments such as harps.

The fact that the Native Americans did not invent the wheel is not at all surprising. Not only is it a far more complex invention than people think; moreover, given the level of ingenuity required, it is likely that the invention only happened once, and then spread throughout Europe, Asia and Africa – but for geographical/historical reasons, it didn't reach the Native Americans.

Source: based on an article from Scientific American
"Why it took so long to invent the wheel" by Natalie Wolchover
© scientificamerica.com, March 2012

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Document A:

Extract from Historical Boys' Clothing website, <http://histclo.com/chron/na.html>

Figure 1: Map, AQA

Figure 2: Timeline, AQA

Document B:

Figure 3: Machu Picchu, © Thinkstock

Figure 4: Pyramid of the Sun, © Prisma Bildagentur AG / Alamy

Figure 5: Pre-Columbian pottery, © Helios Gallery

Figure 6: Greek pottery, De Agostini/Getty Images

Figure 7: Line drawing of potter's wheel, AQA

Stone potter's wheel, © Pjr Travel / Alamy

Man with potter's wheel, © National Geographic Image Collection / Alamy

Figure 8: Pre-Columbian wheeled toy jaguar, courtesy of The Bowers Museum

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