# Living Together:
## Muslims in a changing world

## Age 9-11: Exploring Cultural Contributions - the Sciences

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# Intro to Islamic Heritage

The legacy of Islamic scholars and inventors goes back over 1000 years. There are four areas that will be investigated: botany, mathematics, irrigation, and geography. However, there are many areas like medicine, architecture, and law that have strong and important legacies as well.

# Botany

As the Islamic world grew, Muslims began to settle from Spain to China. They were able to grow and cultivate even the driest lands. They could identify what plants would grow in certain soils and they mastered grafting techniques. Grafting is the method of attaching a piece of one plant to another. The two pieces join and become one plant. People who were skilled at grafting could take plants from one area and introduce them to another area.

Diagram 1 is a diagram of one type of grafting called Whip Grafting.
Diagram 2 is a diagram of a tree with grafted branches.

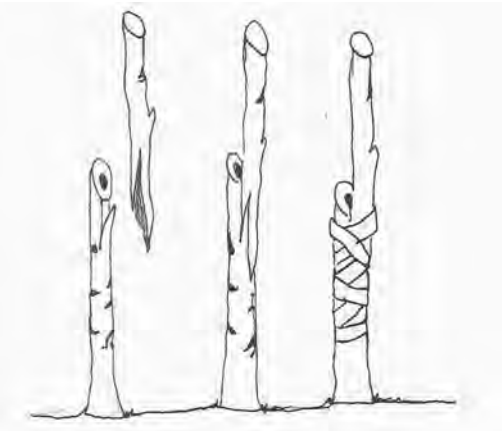

Diagram 1

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Diagram 2

## Activity: Define These Words

*Hundreds of years before Linnaeus created the Western system of plant **classification**, Ibn Baytar or Ibn Baitar (1197 - 1248 CE) developed a classification system for plants that was well known and highly regarded in the Islamic world. Ibn Baytar was interested in **pharmaceutical** herbs and flowers. He explored throughout Spain and Morocco, looking for new and unique **medicinal** herbs and flowers. He created a dictionary of 2000 herbs and flowers, explaining what they were and how they could be used. He wrote the information in Arabic, Greek, **Berber**, Latin, as well as in several local **dialects**. He wanted everyone to have this knowledge.*

Find the meaning that best suits each of the bolded words in the paragraph.

1. classification

2. pharmaceutical

3. medicinal

4. Berber

5. dialects

## Activity: Researching Plants

Research the following plants and classify the plants into logical groups after you have completed the organizer. Explain your reasons for the group.

| Plant | Part of plant used | Uses |
|---|---|---|
| Ginger | | |
| jojoba | | |
| aloe vera | | |
| banana | | |
| Empress candlestick | | |

*i)* **Logical groups**
Add as many lines as needed.

1. _____, _____, _____

because _____.

2. _____, _____ , _____

because _____.

3. _____, _____, _____

because _____.

# Mathematics

Islamic mathematicians laid the foundations for modern mathematics. They gathered information from Indian and Greek mathematicians. To this information, they added their own knowledge.

Al – Khwarizmi (780 – 850 CE) was one of the first mathematical faculty members at the Dar al – Hikma or House of Wisdom in Baghdad. The House of Wisdom was dedicated to the promotion of teaching and learning.

Al - Khwarizmi wrote two mathematical text books which played an important role in the history of math. The first book contained the Arab word al – jabr in its title. Its content dealt with the development of solutions to mathematical problems in which there was an unknown quantity. He wanted the book to be practical so people could use it to measure their lands and dig their canals.

$$\textit{Examples: } a = l \times w \qquad v = l \times w \times h$$

Western monks transliterated the title into Latin. They spelled the word using the characters of the Latin alphabet. It became algebra.

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His second book introduced the Hindu numbering system. Scholars soon found the nine characters, 1,2,3,4,5,6,7,8,9 , and the use of the circle for zero far superior to the Roman numerals they had been using.

Scholars had been able to add and subtract Roman numerals but were unable to do anything more complicated. Because the Europeans learned this system from the Arabs, it has been referred to as the Arabic numbering system even though it was originally developed by Hindus.

## Activity: Write in Numerals

There are seven letters that represent all Roman numerals. They can be used alone or in various combinations to make every number.

This chart shows how the numbering system changed.

| Roman numeral | Arabic number |
|---|---|
| I | 1 |
| V | 5 |
| X | 10 |
| L | 50 |
| C | 100 |
| D | 500 |
| M | 1000 |

**Write the following using Roman numerals.**

Your birth year _____

The year your house was built _____

The current Super Bowl _____

Chapter 45 _____

The year your school was built _____

**Fill in the chart.**

| | |
|---|---|
| XXX | |
| | 97 |
| | 53 |
| XC | |
| MMVIII | |
| XLVI | |
| | 160 |
| | 7000 |
| LM | |
| | 555 |

**Answer the following problems.**

L – XV = _____

CL + V = _____

M – DL = _____

## Activity: Questions About Numbers

1. Why do you think Arab scholars dropped Roman numerals and began using the Hindu system?

2. Why do you think people use Roman numerals today?

3. What effect do you think the development of zero (0) has had on mathematics?

# Irrigation

As the Islamic world grew, so did their influence on agriculture. They had extensive botanical resources but many needed a regular supply of water. So, in order to grow bananas, sugar cane, and coffee, they developed a widespread irrigation system.

In some places, qanats were built. These were tunnels that carried water from an underground source to a ground surface in another location. In Iran, there are 274,000 kilometres of underground channels. Until a few years ago, most of the network was still working, over a thousand years after they were first built.

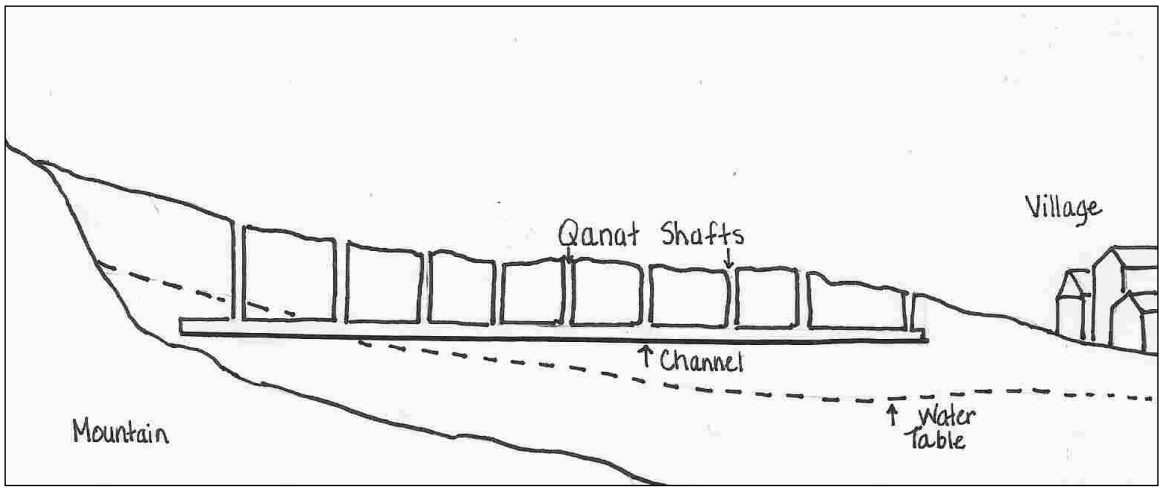


Diagram of a typical qanat.

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Norias, similar to water wheels, were also constructed to provide an ongoing water supply to agricultural lands. They provided water everywhere.

Muslims also developed canal networks which supplied the water necessary for the production of crops, particularly in Spain. Many canals continue to provide water to orchards and rice fields today.

Use this website to see how canalling worked in Mesopotamia, the area now known as Iraq, parts of Syria and Turkey and southwest Iran.
http://www.mesopotamia.co.uk/geography/challenge/cha_set.html

Today, environmentalists hold these traditional methods of irrigation in high esteem. Edward Goldsmith, an environmentalist, writes:

> *Modern irrigation schemes in tropical areas are **almost without exception**, social, ecological and economic disasters. They necessarily lead to the flooding of vast areas of forest and agricultural land, the **displacement** of hundreds of thousands of people and the spreading of waterborne diseases like **malaria** and **schistosomiasis**. In addition, they are badly run, poorly maintained and the irrigated land is soon **salinised** or water-logged, while the reservoirs where the water is stored, rapidly **silt** up. The remarkable traditional irrigation systems they have replaced, on the other hand, not only worked perfectly, but also satisfied all social and ecological **imperatives**.*


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Rather than the simpler qanats and norias of the past, governments have encouraged the construction of dams as a relatively cheap way of providing water for irrigation and hydro power for generating electricity.

Because of advances in concrete technology and the invention of machines that can literally move mountains, today's dams are huge. But they come at a cost. China's Three Gorges dam on the Yangtze River has caused 1.2 million people to relocate.


**Three Gorges Dam under construction**
**Thomas Barrat/Shutterstock Images LLC**

## Activity: Define the Words

Explain the following words as they apply to the reading. Edward Goldsmith, an environmentalist, writes:

> *Modern irrigation schemes in tropical areas are **almost without exception**, social, ecological and economic disasters. They necessarily lead to the flooding of vast areas of forest and agricultural land, the **displacement** of hundreds of thousands of people and the spreading of waterborne diseases like **malaria** and **schistosomiasis**. In addition, they are badly run, poorly maintained and the irrigated land is soon **salinised** or water-logged, while the reservoirs where the water is stored, rapidly **silt** up. The remarkable traditional irrigation systems they have replaced, on the other hand, not only worked perfectly, but also satisfied all social and ecological **imperatives**.*

1. almost without exception

2. displacement

3. malaria

4. schistosomiasis

5. salinised

6. silt

7. imperatives

## Activity: Questions for Discussion

Why do you think countries build huge dams to supply irrigation needs rather than relying on traditional Islamic methods?

**Debate:** Traditional Islamic methods of irrigation have a place in today's environment.

# Geography

The Islamic empire expanded dramatically. By about 800 CE, the land of Islam spread from Spain to the Chinese border. Muslims everywhere were asked to visit Mecca at least once in their lives. Muslims traveled to Mecca from all over the empire. Many travel guides were written to help travelers on their pilgrimage.


Chen Ping Hung/Shutterstock Images LLC

There were no borders. Routes were safe and people could travel wherever they wished.

Two famous Islamic geographers were Al-Idris and Ibn-Batuta. They added to work already done by Greek and Roman geographers.

## Al-Idris

(1099 – 1165 CE)

Al-Idris was a geographer who worked for King Roger II of Sicily. He wrote a geography of the world complete with maps. He also figured out that the circumference of the world was 37,000 kilometres. (The circumference is 40,000 kilometres approximately).

## Ibn-Batuta

(1304 – 1369 CE)

Ibn-Batuta completed a pilgrimage to Mecca in 1325. He decided that he wanted to travel. He went on to visit Africa, Russia, India, and China. He traveled approximately 120,000 kilometres in his lifetime. He traveled more than anyone else at that time.

## Activity: Plan a Trip!

Plan a trip from Seville in Spain to Mecca. You have a Canadian passport for this assignment.

Display your trip on posterboard. Include the following:

1. Appropriate transportation: car, train, and/or boat
2. Route:
    a. draw a map showing the route
    b. list the countries you travel through
    c. outline the main geographical features you will see (rivers, mountains, deserts)
3. Describe the clothing you will need
4. Documents you need to take: passports, visas
5. Security issues you may encounter
6. Similarities and differences between travel today and travel during Ibn-Batuta's time