

Greco-Roman Mathematics

A Project-Based Learning Lesson

Lessons Learned

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Issues with STEM Project

- Too ambitious, nebulous, broad.
- Short Description: Ancient Greco-Roman inventions and scientific discoveries continue to exercise a large influence on daily life in the modern world. Though it has been thousands of years since these inventions and scientific principles have been introduced, we can still see evidence of it in our art, architecture, technology, literature, language, and law.
- The ancient Greco-Roman world pioneered advances in many areas of science and technology, establishing tools and methods that have ultimately shaped the way the world does certain things.

Other Difficulties

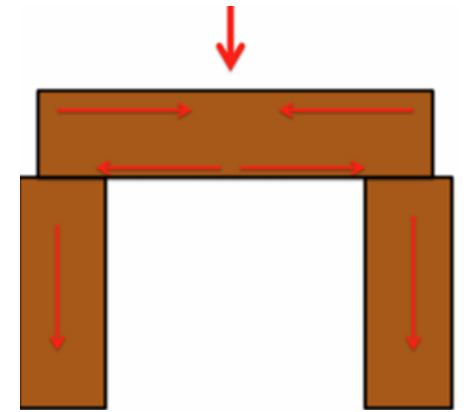
- Pre-emergent culture in applying PBL
- Projects vs. activities.
- Lack of mathematics/engineering prerequisite skills.
- Lack of resources/support
- Frame work & timeframe

The Arch in Roman technology & Architecture

- The foundation of roman civilization rested on the arch
- An arch is a structure that spans a space and supports structure and weight above it.
- The Roman arch was the foundation of Rome's architectural mastery and massive expanse of building projects across the ancient world. It allowed the Romans to make bigger buildings, longer roads, and better aqueducts. The Roman arch is the ancestor of modern architecture.

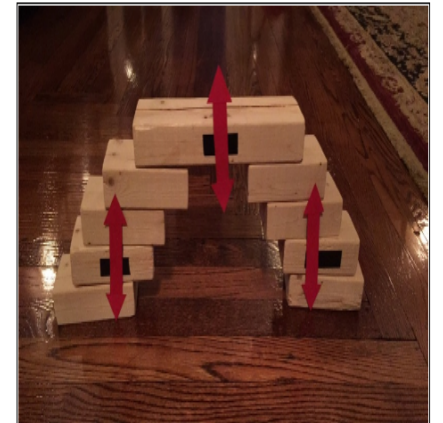
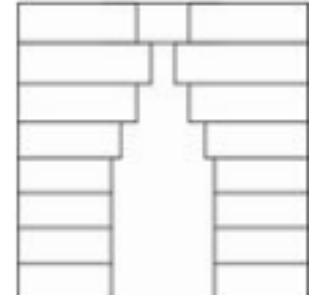
Post-and-lintel system

- Two upright posts hold up a horizontal post (lintel) laid horizontally across their top surfaces.
- Doorways, gates, colonnades other structural openings have evolved from this system.
- In the Post-and-lintel system, the lintel must bear loads that rest on it as well as its own load without deforming or breaking. The posts must support the lintel and its loads without crushing or buckling.



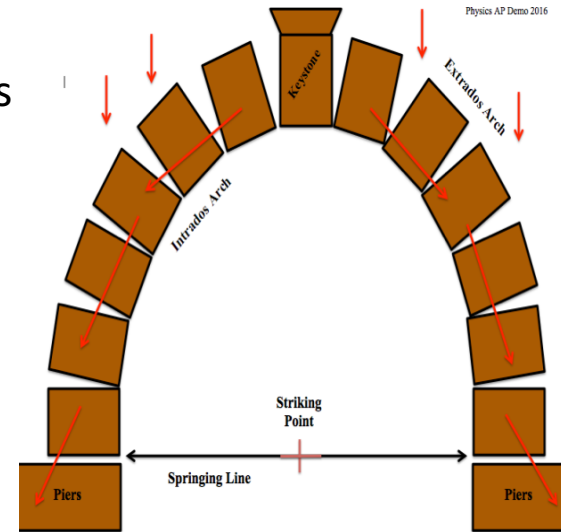
The Corbelled Arch

- A corbel arch is an arch-like construction method that uses the architectural technique of corbeling to span a space or void in a structure, such as an entranceway in a wall or as the span of a bridge.
- The span of corbeled arch weight bearing is limited due to the distribution of vertical loads horizontally to the stones below, i.e., the side forces are not converted in to compressive stress.
- This limitation prohibits their use in design of structures that rise at rather steep angles or when the center of the arch gets too far past the balance of the protruding bottom stones.



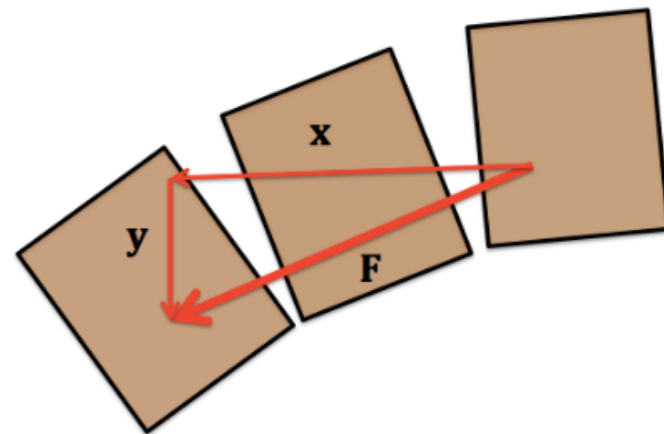
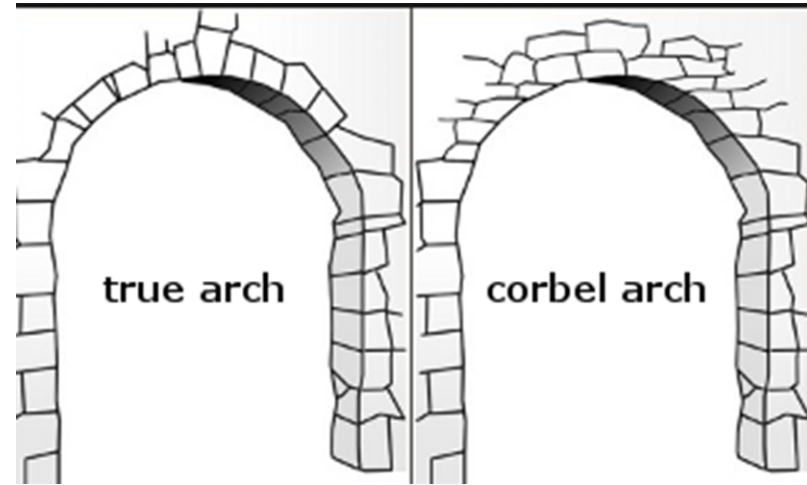
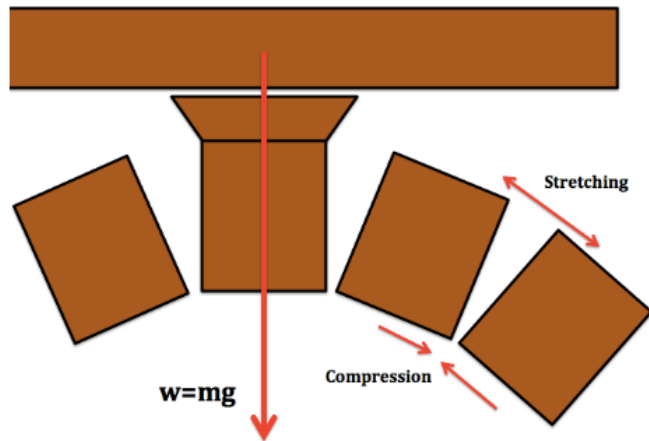
The Roman Arch

- Arches appeared as early as the 2nd millennium BC in Mesopotamian brick architecture and their systematic use started with the Ancient Romans who were the first to apply the technique to a wide range of structures.
- Rounded arches were used by Roman builders to span large, open areas.
- Several rounded arches placed in-line, end-to-end, form an arcade, such as the Roman aqueduct.

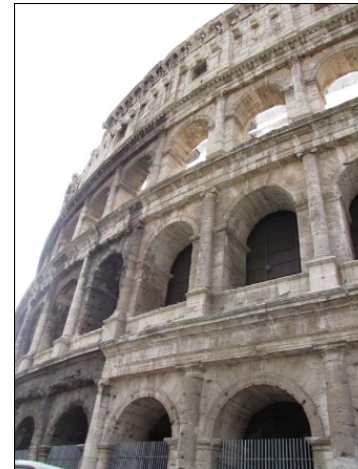
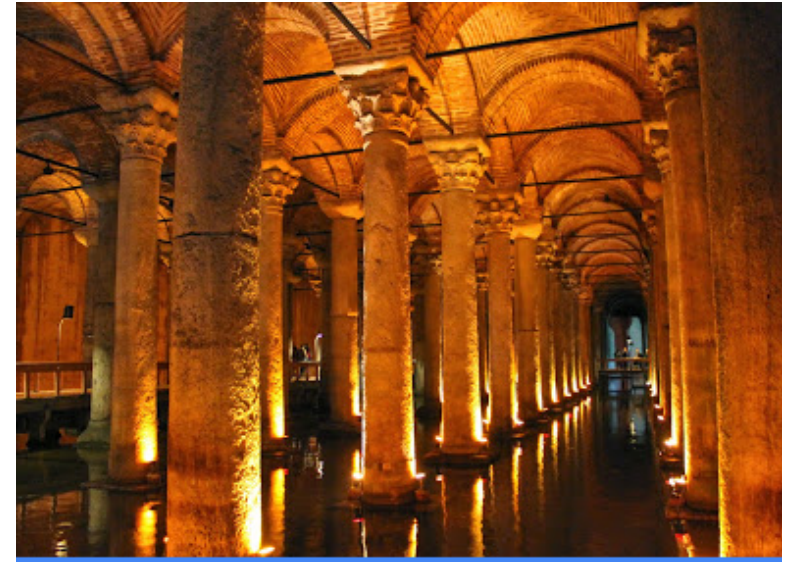


The physics of the round arch

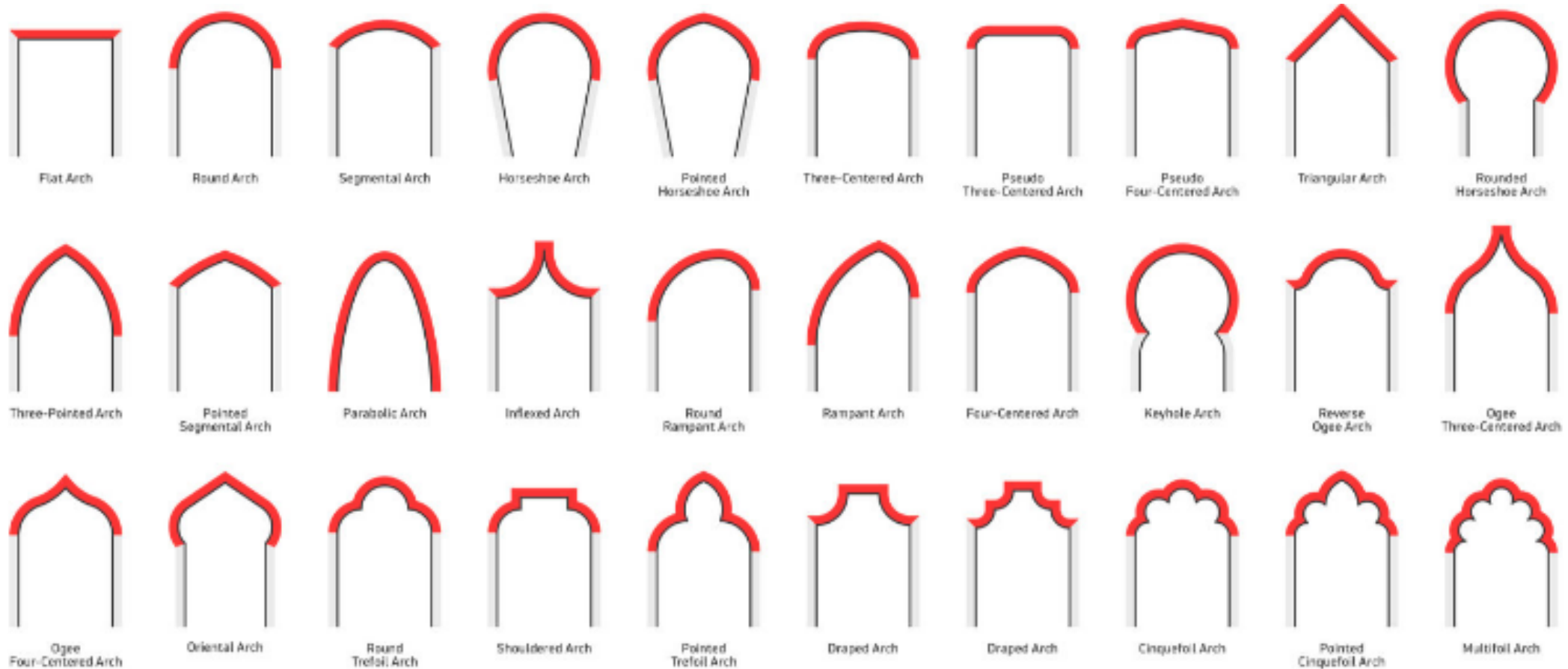
- The physics of Corbel vs true arch



The Roman Arch in action



Different Types Arches Used In Architecture



Topics For Projects

- Evolution of the arch: Post-and-lintel, Corbelled Arch, Roman Arch, Vaulted, Cross-Vault

Modules

- Arches: styles & functions: Roman, Gothic, Baroque and Renaissance arches
- Applications of arch technology: Arch bridges, aqueducts, domes, basilicas, tunnels, sewers
Cisterns, & ceiling vaults
- The Arch: The channeling of forces.
- Arch construction: the suitable materials for building archs
- Arches as edifices of social symbolism.
- Arches in architecture: The style, form, & function of arches in architecture
- Arch-technology across history & cultures