The Master Mason's Challenge

Teachers' TOOLKIT

HISTORIC ENVIRONMENT SCOTLAND | ÀRAINNEACHD EACHDRAIDHEIL ALBA

#LearningWithHES

Contents

Cover: Medieval builders.

Introduction

What is the Master Mason's Challenge?
The Master Mason's Challenge is a series of STEM provocations set in the context of building a Medieval castle.

It is part of a suite of Castle Construction themed resources that support learning in the classroom, online and at the many castle sites, including Stirling Castle, that are cared for by Historic Environment Scotland (HES).

Who is it aimed at?
The Challenge has been designed for the EY-P3 age group, but can be adapted for other ages of learners to suit.

What does it involve?
The Challenge comprises three films which present a problem for learners to solve in their classroom. The films can be used in their own right or used before or after a visit to a castle site to extend learning.

YouTube playlist:
https://tinyurl.com/MasonPlaylist

This Teachers' Toolkit provides information, ideas, resources and links to enable teachers to support learners to tackle each challenge.

A modern mason's mark carved into a stone at St Andrews Cathedral undercroft.

A treadwheel crane in use at Castle Guedelon.

© Castle Guedelon.

An artist's impression of the building work carried out at Huntingtower Castle.

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The Master Mason's Challenge and the Curriculum

Each challenge encourages the development of learners' creative thinking and problem solving.

The solutions are about learners thinking creatively and coming up with their own ideas and designs, but examples of how to solve some of the problems can also be found in HES' Castle Construction Challenge resource, available to download as PDF files from the HES website.

Overarching learning objectives

- to encourage the use of the historic environment as a context for STEM learning
- to support castle topics in schools
- to provide an interdisciplinary learning opportunity
- to provide a context for learners to learn problem solving skills and develop creative thinking

The challenges support a range of Curricular areas including STEM subjects, social subjects and literacy and suggested experiences and outcomes are listed.

There are also opportunities to explore the World of Work by looking at careers in traditional skills, like stone masonry.

A short video about an apprentice stonemason at HES is available via the link below:
https://tinyurl.com/StonemasonHES

Technologies
TCH 0-05a, 1-05a
Awareness of technological developments, past, present and future.

TCH 0-09a, 1-09a
Design and construct models.

TCH 0-10a, 1-10a
Exploring use of materials.

TCH 0-12a, 1-12a
Application of engineering.

Literacy
LIT 0-02a, 1-02a
Tools for listening and talking.

LIT 0-09a, 1-09a, LIT 0-10a, 1-10a
Creating texts.

Sciences
SCN 0-07a, 1-07a
Forces.

SCN 0-15a, 1-15a
Exploring properties and selecting materials.

Expressive Arts
EXA 0-06a, 1-06a
Use imagination to solve design problems.

Social Studies
SOC 0-04a, 1-04a
Compare lives in the past with my own.

Numeracy & Maths
0-16a, 1-16a, 2-16a
Properties of 2D shapes and 3D objects.

A young learner using loose parts to build a model castle.

More ideas for castle-related activities
https://tinyurl.com/LearnCreatePlay

YouTube playlist of Master Mason films
https://tinyurl.com/MasonPlaylist

Overview of Challenges

A Medieval character – Peter the Master Mason – presents a series of problems he has encountered and asks learners for their ideas in overcoming those problems.

There are three challenges to undertake:

- Getting stones out
- Making stones move
- Lifting stones up

Plus an extension activity.

There is a sequential order, but one specific challenge can also just be chosen.

There are clues in the films for simple tools/equipment that could be used to solve the problems presented.

A Suggested Resources list can be found at the end of the Toolkit on page 19.

By completing all three challenges, learners will successfully become Master Masons and can be given a certificate (an example is provided in this Toolkit).

A still from the films.

Image of thumbnails for the Master Mason's Challenge films.

More ideas for castle-related activities
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Key STEM Principles

The Master Mason's Challenge covers a number of key technology principles including simple machines and tools, as well as science principles including forces. Teachers may find the definitions below useful to help support learners' learning.

Levers

A lever is a simple machine made of a rigid **beam** and a **fulcrum**.

The **effort** (input force) and **load** (output force) are applied to either end of the beam.

The fulcrum is the point on which the beam **pivots**.

When an effort is applied to one end of the lever, a load is applied at the other end of the lever. This will move a mass upward.

Forces

Forces make things move, change shape and balance.

All forces are pushes or pulls (e.g. lifting); a twist is a particular type of push or pull.

You can't see a force, but you can see it working.

Mass

Mass is the amount of matter in a solid (like a stone), liquid or a gas.

It is measured in kilograms and grams.

In everyday life, mass and weight are often interchangeable, but in physics, mass is defined as the amount of force exerted on an object due to the pull of gravity.

Friction

Friction is a force that acts on two surfaces that causes resistance and can make objects difficult to move (especially when combined with mass and gravity).

A re-enactor dressed as a Master Mason uses pincer grabs to lift a block of stone.

Pulleys

A pulley is a simple machine consisting of a wheel and a rope which is useful for lifting things.

It reduces the effort required to raise a load.

The rope has a load on one end and someone or something pulling at the other end.

Gravitational energy

Gravity is a type of energy. It pulls two objects together.

Earth's gravity pulls objects down and holds them on to the ground.

CHALLENGE 1

Getting Stones Out

Aim
To design a simple tool that can be used to lift a 'stone' off the ground.

Key STEM principles
Levers, forces and mass.

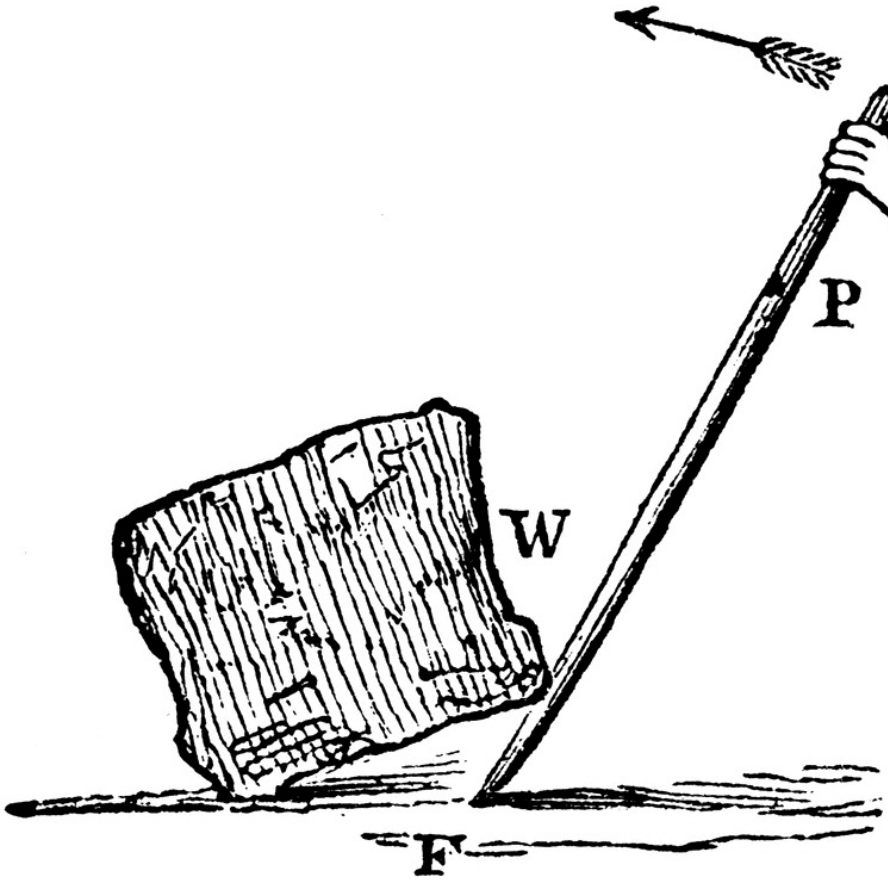
Task
Peter, the Master Mason, is having difficulty getting some heavy stones out of the ground at the quarry. He needs them for a castle he is building. Can learners design a simple tool that will help him?

Ask learners to watch *The Master Mason's Challenge: Getting Stones Out* film then discuss as a whole group what the problem is and brainstorm possible ways to solve it.

Then either in pairs or small groups, ask learners to design, make and test a tool that could lift a stone out of the ground. This could be on paper or using junk/recycled material or loose parts. It could also be done inside the classroom or in an outside play area.

Learners can then test, describe, share and demonstrate their design

Discuss what the limitations are of using the design/method.



An example of a lever.

Key resources

- Paper and pens
- Construction materials (loose parts, recycleable material or craft materials – see Suggested Resources list on page 19)
- An object to act as a 'stone'

Hints, tips and links

The problem can be solved by using a simple machine (a lever) that creates mechanical advantage, making it easier to lift the stone.

Hints in the film

Wooden plank (lever) and wooden block (fulcrum) feature in the foreground.

Take it further

Take it further by asking learners to find examples of levers in the school or home, for example a see saw in the playground, bottle opener, clothes peg or a pair of scissors or garden shears.

More ideas for castle-related activities
https://tinyurl.com/LearnCreatePlay

YouTube playlist of Master Mason films
https://tinyurl.com/MasonPlaylist

CHALLENGE 2

Making Stones Move

Aim
To create a method that would make moving a ‘stone’ easier.

Key STEM principles
Friction, mass, gravity and force.

Task
Peter, the Master Mason, is having difficulty moving the heavy stones he needs for the castle he is building. He needs to move them from the quarry to the castle building site. Can learners design a way to make it easier for Peter to move them, using less energy?

Ask learners to watch *The Master Mason’s Challenge: Making Stones Move* film then discuss as a whole group what the problem is and brainstorm possible ways to solve it.

Then either in pairs of small groups, ask learners to design, make and test a way that would make it easier for Peter to move the stones along the ground. This could be on paper or using junk/recycled material or loose parts.

It could also be done inside the classroom or in an outside play area.

Learners can then test, describe, share and demonstrate their design

Discuss what the limitations are of using the design/method.

A roller reduces friction.

Key resources

- Paper and pens
- Construction materials (loose parts, recyclable materials or craft materials – see Suggested Resources list on page 19)
- An object to act as a 'stone'

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YouTube playlist of Master Mason films
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Hints, tips and links

The problem can be solved by reducing the friction between the stone and the ground to make it easier to move the stone. An example can be found in the **HES Castle Construction Challenge** online resource.

Hints in the film

Logs & trees (rollers); wooden plank; length of rope.

Take it further

Take it further by asking learners to find examples of where friction is reduced in the school playground or home, for example a bicycle, a wheelbarrow, a trundle wheel, a suitcase.

CHALLENGE 3

Lifting Stones Up

Aim
To create a method of lifting a ‘stone’ to a height.

Key STEM principles
Pulleys, gravity, mass, energy and forces.

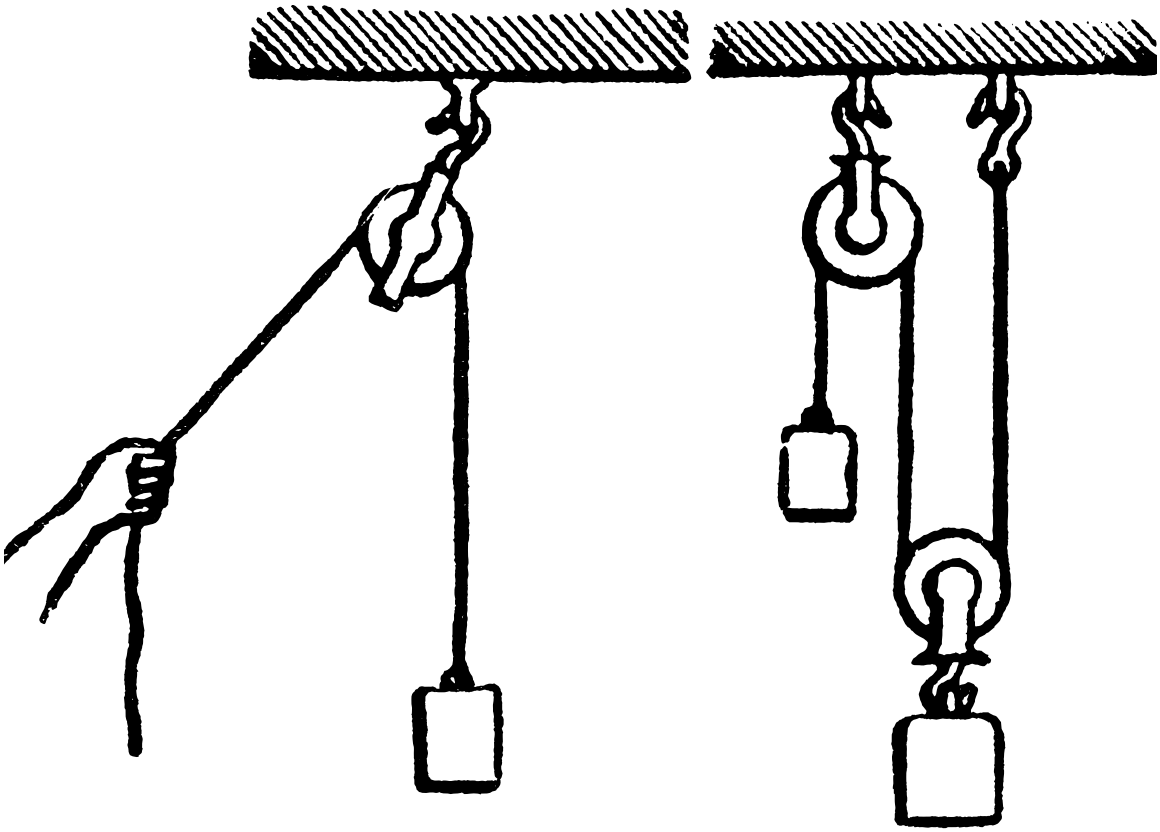
Task
Peter, the Master Mason, is having difficulty lifting the heavy stones to the top of the walls of the castle he is building. Can learners design a way for him to do this?

Ask learners to watch *The Master Mason’s Challenge: Lifting Stones Up* film then discuss as a whole group what the problem is and brainstorm possible ways to solve it.

Then either in pairs or small groups, ask learners to design, make and test a way for Peter to lift a stone to the top of a wall. This could be on paper or using junk/recycled material or loose parts. It could also be done inside the classroom or in an outside play area.

Learners can then test, describe, share and demonstrate their design

Discuss what the limitations are of using the design/method.



A pulley creates mechanical advantage.

Key resources

- Paper and pens
- Construction materials (loose parts, recyclable material or craft materials– see Suggested Resources list on page 19)
- An object to act as a 'stone'

More ideas for castle-related activities
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YouTube playlist of Master Mason films
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Hints, tips and links

The problem can be solved by using a simple pulley that creates mechanical advantage, making it easier to lift the stone. An example can be found in the **HES Castle Construction Challenge** online resource.

Hints in the film

Peter is sitting on a cable reel (a pulley); lengths of rope lying around.

Take it further

Take it further by asking learners to find examples of where pulleys are used to overcome friction or lift things up, in the school or home, or elsewhere, for example a roller blind on a window, a traditional well, a crane on a building site, a mast/ sail on a ship, or a castle drawbridge.

CHALLENGE 4

Extension Activity A Model Castle

Aim

To design and build a model castle using 3D shapes.

Task

Ask learners to use what they have found out to create a model of a Medieval castle building site, incorporating versions of the tools and methods they have designed or built.

This can be at miniature scale or large scale. They could even create and cut out castle builder characters including the Master Mason to put in their castle – or dress up as one themselves.

Learners could act out what is happening, creating dialogue between characters and describe what is happening at the building site.

A model castle built using 3D shapes.

A model of medieval scaffolding.

© F. Davidson.

Key resources

- Construction materials (loose parts, building blocks, recyclable material or craft materials – see Suggested Resources list on page 19)
- Image of Medieval Builders banner – see front cover.

Nether Bailey yett at Stirling Castle.

© F. Davidson

Hints, tips and links

Some suggestions for tackling this challenge can be found in. the **HES Castle Construction Challenge** online resource.

Website for Castle Guedelon, a project to build a castle in France using only traditional Medieval methods:
https://tinyurl.com/CastleFrance

A short film about how Castle Guedelon is being built (in English):
https://tinyurl.com/FrenchCastleBuild

A playlist of short films about the different trades and crafts involved in building Castle Guedelon (in French but with subtitles):
https://tinyurl.com/GuedelonPlaylist

More ideas for castle-related activities
https://tinyurl.com/LearnCreatePlay

YouTube playlist of Master Mason films
https://tinyurl.com/MasonPlaylist

RESOURCES

Suggested Resources List

Bottom left: illustration of Medieval masons preparing to carve a piece of stone with a design inscribed on it.

It might be useful to have some of the following resources available for pupils for the challenges. This is not an exhaustive list. Loose parts, recycleable materials and/or craft materials or other resources in the classroom can be used.

Try to have a wide variety of materials available, in a range of sizes, to provide choice for learners' imagination.

- Wooden play blocks
- Cotton reels/wooden reels
- Cardboard tubes (kitchen roll, wrapping paper roll, crisp tubes, carpet roll tubes)
- Dowel/round wooden lengths
- Rulers/short lengths of flat wood (wooden blocks, small log, a brick, plastic crate or eraser)
- Broom handles
- Rope/cord/string
- Cardboard (boxes, flat pieces, large and small)
- Pieces of hardboard
- Trays
- Small buckets/pails with handles
- Knex or similar
- Scissors, hole punches
- Tape, velcro or other types of fixings
- Paper, pencils
- Pegs/clips

An artist's impression of the construction underway on the north front of Linlithgow Palace, around 1620.

Certificate
of Completion

This certificate is awarded to

_____

for demonstrating the skills
and knowledge required
to be a medieval stonemason and
completing their apprenticeship
at Stirling Castle.

Completed in the year of our Lord 2025

Peter the Master Mason