ACTIVITY DOSE PROJECT '22 –

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Title Activity	
Age	**1st grade (6-8y)** **2nd grade (8-10y)** **X 3rd grade (10-12y)**
Estimated duration	4u
learning objectives / competences	(The pupils can ...) - The students derive the laws of forces from authentic contexts - The students investigate observable properties of common materials and raw materials in function of a technical process. - The students investigate principles of construction and operation of technical systems, - The students carry out an iterative technical process to create a simple technical system based on needs and criteria - The students design a technical system according to the given requirements - The students realise the technical system on the basis of a design - Students test whether a technical system meets the needs and criteria - The pupils go through a problem-solving process that integrates knowledge and skills from several STEM disciplines. - Students illustrate the interaction of STEM disciplines with each other and with society - The pupils argue the choices they make to solve a mathematical, scientific, technological or STEM problem
Short description of the activity (max. 4 sentences)	
Pupils learn about the life and living standards of the Romans. Romans had a real bathing culture and needed a lot of water to do so. How did they provide themselves with sufficient fresh water? Pupils take on the role of Roman engineers and build their own aqueduct!	

CONTEXT	
Motivation	Nowadays, the average water consumption of a Belgian is 110 litres per person and day. This is not so different from the average Roman, who used approximately 100 litres of water per person per day. If you include the water consumption of fountains and baths, the counter rises to no less than 500 litres per day. And on top of that comes the water that the Romans needed to stage naval battles in their amphitheatres. All that water was not readily available in the cities. The water that flowed into the rivers was far insufficient to maintain their high standard of living. The Romans therefore brought water from distant sources, via long water pipes or aqueducts. These can be compared to our current waterworks. The aqueducts of the Romans are real technological tours de force. Not only do they (still) look impressive, but about 2,000 years ago, they already ensured that Roman cities had continuous access to fresh water for bathhouses, fountains and private use.
Where is the STE(A)M integration ? (in a few words, small checklist for yourself)	**S: communicating vessels, flow rate of water, pressure of water** **T: handling of materials, construction of an aqueduct, arch constructions, sturdiness** **E: aqueduct must meet criteria, e.g. drop of 23cm/km, bridging distance of at least 1.5 m** **A: Bow or arch constructions; Designing a nice aquaduct** **M: capacity measures**
Methodology and required materials	
Materials	Per class: ● nearpod ● Pupils bring construction material. Per group: ● Plastic bottles ● Measuring rod ● Tape ● Bucket specific local requirements: The pupils will have to build an aqueduct in groups. Provide each group with a route that the water must follow. Start each route by placing a water source at a specific height. Then, for example, place a table, a chair and a pile of books in a row, with a distance of half a metre to one metre between them. Finish with a low container that will catch the water. You can also make the path that the water has to follow more difficult by, for example, placing two chairs in a row with 2 metres between

	them. To bridge this landscape element, the pupils should use the law of communicating vessels and add a pressurised pipe.

Coaching & methodology (your 'lesson preparation')

Are you paying attention to the research questions you are going to ask? Do you let your pupils investigate on their own?

Timing	**Intro:**

Intro:

Fresh water for the Romans. How do they get it?

As a teacher, this can be used in various ways. To explain the law of communicating vessels, an experiment can be done as described below.

Also to demonstrate the solidity of an arch structure, the children can do an experiment with blocks to make an arch bridge.

An interactive Nearpod exercise is used to learn about the different transport possibilities of water.

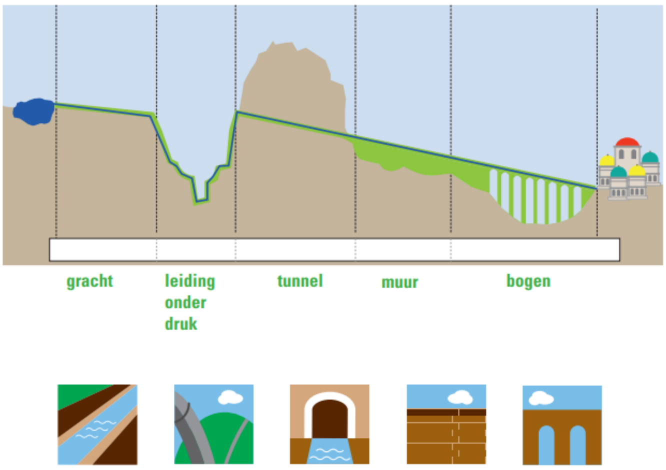
Part 1: Aqueduct: What you need to know!

Law of communicating vessels:

Take two bottles and a piece of hose. Fill one bottle three-quarters full with water and insert the hose. Suck the hose full and close the end with your thumb. Make sure the full bottle is higher than the empty one and transfer the other end of the hose to the empty bottle. Pick up the two bottles and hold them at different heights. The water will always flow from the bottle with the highest water level to the other bottle. When the level in both bottles is equal, the flow stops. As soon as you raise one bottle, the flow will start again.

Strength of a structure: the importance of arch structures

Different transport possibilities for water (see Nearpod): Covered ditch, Tunnel, Pressure pipe, Walls, Arches



Part 2: A virtual aqueduct!

At the start of the experiment, divide the pupils into groups of three or four. They have now learned how an aqueduct is constructed and what the different parts of an aqueduct are used for. The first task of the experiment is a thinking exercise in which they have to apply the knowledge they have already acquired by reconstructing a virtual aqueduct. Go over the solution in the classroom. What is good? What could be better?

Part 3: Aqueduct in the classroom

Now, build a sturdy aqueduct with your group that can bridge a distance of 1.5 metres, and where the water reaches the city at a constant speed without wasting water! Remember! The aqueducts of the Romans had a drop of 23 cm per km.

How much is that over 1.5 metres? Try to aim for that same decay.

Challenge! As teachers, you can place a number of obstacles along the way that the pupils have to cross with the aqueduct.

Tip: Let the pupils make a working drawing first.

A real engineer first puts his thoughts on paper. Draw the route and indicate on your drawing how the water should flow. What differences in height need to be overcome? Which parts will you use?

Have students also explain why they use certain construction materials.

Part 4: Reflection and optimisation

What are the strengths of our aqueduct?

What are the weak points of our aqueduct?

	How can you improve the weak points? How can you make your aqueduct stronger, more useful and less wasteful? Try to implement the suggested changes now and improve your aqueduct. Did you succeed? Evaluate! **Possible extension** Water towers: water transport in our time.

How do you evaluate the acquired competences of the pupils during this activity? **(e.g. specific questions, extended instruction, differentiation,...)** **Is there an evaluation after the activity to record the acquired knowledge/skills?**
Tips & tricks (which would you give to another teacher to make that lesson go more smoothly)
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