Form 1
Filter column

Senario: after natural disaster, no water and electricity supply, the government would like to teach citizen to how to make a DIY filter column to obtain clean
Values:empathy, responsibility and commitment, law-abiding

Term 1 late November
1.   Problem definition (lesson 1)
2.   Problem analysis (lesson 1)
3.   Produce prototype (take home assignment)
        Use domestic materials (e.g. cotton wool, tissue paper, kitchen paper) to build a filter column
4.   Testing (lesson 2)
        Provide muddy water to test the efficiency of the filter column
        Measure the turbidity of the filtrate (with spectrometer), using water as control
5.   Evaluation (take home assignment)

Student booklet
https://drive.google.com/drive/u/0/folders/1bHxNZVjS-Wf5AoQB89jpYbQXyyo4Yh52

Pre/While/Post WS
https://drive.google.com/drive/u/0/folders/1ZFUAsAoHy-_eAgpcvbAid-3IrjRMCxvG

Term 2 Jan & Feb
1.   Improve prototype
2.   Test and compare the effectiveness and efficiency of different filter materials (IS)
3.   Decision making:
        Choices of materials (at most 3)
        Sequence of materials in filter
        Ratio of materials in filter
4.   Testing
        Use micro:bit to measure water quality (Technology)
        Calculate water flow rate (MATH)

Form 2
Water Rocket Competition (2023)
Vertical launch- Fly the rocket as straight and high as possible

Time:
Term 2 before Easter

Design:
- Volume of water added (Weight distribution / centre of gravity)
- Different pressures (max. Is 100 psi)
- Design fins (material and shape)
- Choice of water bottle

Rundown:
Trail round > Heats > Final > Submit Project Report
All team members in same house and same class, 3-5 students per team
SA involves in competition day and scores will be counted for school houses

Assessment:
Rocket Performance scores (based on heats and finals) /10M
Action and Reaction Review /10M
Rocket Design, Effort and Workmanship /10M
Principle of Water Rocket / Reflection /10M
Total : 40M

Values:
In Launching the rocket / competition day
Law abiding (games rules) / Commitment (sportsmanship) / Respect / Care of others (Safety)

Maths & Technology:
Observers use iPad (app) to measure angle of inclination. (angle pro, already in self-service)
Excel formula (notebook) in record station, just enter angles can calculate final height.

Further study / Seeking advice:
- Make use of bluetooth locator to track travel distance and time, (airtag?)
- Ipad app tried : BLEmeasure + Locate, not adopt as slow response time

Technology and MATH elements

Math Challenge Level 2

Can you set up simultaneous equations and get a formula for the height of the rocket H, given the angle of elevations a and b observed by 2 observers, the distance between the observers D, the height of the eyes above the ground h_e? Assume that the observers and rocket all lie in the same vertical plane (the rocket does not come out of or go into the page).

(Hint: add an unknown for the adjacent of one of the angles, set up 2 equations based on the 2 right angled triangles and use substitution to eliminate the extra unknown and make h the subject of the equation. Then, $H = h + h_e$)
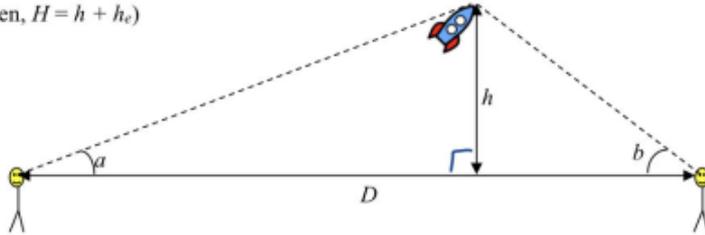
Let the horizontal distance from observer on the left to the rocket position $= x$.

Then $h = x \tan a \Rightarrow x = \dfrac{h}{\tan a}$

and $h = (D-x)\tan b$

$$= \left(D - \dfrac{h}{\tan a}\right)\tan b$$

$$= D\tan b - \dfrac{h \tan b}{\tan a}$$

$$h + \dfrac{h\tan b}{\tan a} = D\tan b$$

$$h\left(\dfrac{\tan a + \tan b}{\tan a}\right) = D\tan b$$

$$h = \dfrac{D\tan a \tan b}{\tan a + \tan b}, \quad H = h + h_e$$