

Lessenserie Energie en Duurzaamheid

In het schooljaar 2017-2018 ben ik in de tweede klas tweetalig vwo bij het vak science2 bezig geweest met het thema “Energie en Duurzaamheid”.

Science2 is een verdiepend science vak, een soort NLT voor de onderbouw. Het is een keuzevak, in zoverre dat leerlingen een keuze maken tussen Spaans of Science2. Naast dat leerlingen verdiepend bezig zijn met stof van Biologie, Natuurkunde of Scheikunde, is het ook de bedoeling dat leerlingen van het tweetalig vwo meer dan ‘gewone leerlingen’ (die in het Nederlands les krijgen) bezig zijn met zowel het gebruik van de Engelste taal (content language integrated learning, CLIL) als met “International Awareness”. Daarom heb ik gekozen voor de werkvormen van een groepspresentatie en een poster presentatie (naast een ‘gewone inleveropgave’). En verder wordt er aan de leerlingen ook gevraagd om in hun presentatie aandacht te besteden aan in hoeverre verschillende Europese landen gebruik maken van (duurzame) energiebronnen.

Omdat het (t)VWO hopelijk een voorbereiding is op een wetenschappelijke loopbaan heb ik gekozen voor een posterpresentatie in de vorm zoals dat ook wel gebruikelijk is op internationale wetenschappelijke congressen.

Tijdens de lessenserie gaan we van ‘van groot naar klein’. Allereerst wordt er gekeken welke energiebronnen er zijn en hoe die werken, en naar hoe verschillende landen omgaan met (duurzame) energie. Vervolgens wordt er ingezoomd naar het eigen (gezins)leven: Hoe kan het eigen huis verduurzaamd worden? Als laatste wordt er ingezoomd op het eigen leven: Hoe kun je je eigen voetprint verbeteren?

Al met al was ik erg tevreden over de lessenserie, alhoewel ik het derde onderdeel, de opdracht over de voetprint, niet heel bijzonder aantrekkelijk en uitdagend vond. De “poster-presentatie” was voor mij een volledig nieuwe werkvorm, dus het was ook een beetje spannend hoe dit zou lopen. Het was uiteindelijk een heel geslaagde en leerzame les.

Hierna volgt een samenvatting van de drie onderdelen van deze lessenserie met de leerdoelen. Vervolgens volgt per onderdeel de opdracht en de planning. Aangezien deze lessenserie in het Engels is gegeven, heb ik ervoor gekozen de opdrachten en planning in het Engels te laten staan.



Figuur: Impressie van de posterpresentaties.

(NB er is (nog) geen toestemming voor het openbaar maken van de foto's in dit rapport)

Overview & Learning Objectives:

Part I (5 lessons):

Energy Sources,

Presentation about 1 energy source

- * Knowing several energy sources.
- * Understanding how electrical energy is generated
- * Knowing which resources are renewable, and which are non-renewable

Part II (6 lessons):

Heat transport: Conduction, Convection and Radiation,

Poster-presentation about “Making your house more sustainable”

- * Energy travels from warmer regions to cooler regions
- * 3 ways of transferring thermal energy
- * How to reduce energy losses from your home
- * How conduction works
- * Some examples of conductors and isolators
- * How convection works
- * How radiation works
- * Knowing some good and some poor absorbers and emitters

Part III (2 lessons):

Footprint

- * Knowing what an ecological footprint is.
- * Ways to improve your footprint.

Part 1
Energy Sources
Presentation about 1 energy source

Assignment:

* A 6-8 minute presentation, answering 3 questions:=

- How does it work? (large part)
- Which countries in Europe use this energy source, and how much? (try to present this as attractive as possible)
- Pros & Cons

* Use figures, animations etc.! You are allowed to use a video / videos from youtube i.e. but with a maximum of 3.00 minutes for videos / animations that are not your own.

* After the presentation you have to answer questions from the audience (2-4 minutes, about 2-4 questions).

Topics: (all groups have a different topic)

Fossil fuels & Power plant (first)

Wind energy

Geothermal

Biomass

Solar

Nuclear

Water: Wave

Water: Tidal

Water: Hydroelectric

Water: Blue energy

Planning:

Lesson 1:

* Introduction on sources of Energy

Lesson 2&3:

* Preparing presentation (6 groups of 3-4 students):

- All groups choose a different topic

Lesson 4&5: (9-2-2018 & 13-2-2018)

* Presentations (Quizmark)

Part II

Heat transport: Conduction, Convection and Radiation, Poster-presentation about “Making your house more sustainable”

Assignment

Contest:

Win 10,000 euro to improve the sustainability of your house!!!
(I'm sorry, it's just an imaginary contest).

Imagine you could win 10,000 euro to improve the sustainability of your own house.
The price will be given to the person who has the best plan and poster-presentation.

Poster:

On the poster you have to present your plan.

Your plan should contain:

- * Current status of your home
- * Plan for improvements
- * Include theory about 'How/why does it work'. When you are choosing to use certain insulation materials, explain why it works (using the theory of heat transport). When you are choosing to buy PV/Thermal solar collectors, explain how they work.
- * Expected benefits/outcomes (how much energy and money do you save per year?).

Hints:

- # Use figures!
- # No long texts.
- # Use bullet points

Presentation:

The poster will be presented on a 'market'.
There will be 6 rounds. (see schedule)
8 students will be presenting simultaneously
You'll present your poster twice
You'll watch and listen four times.
Comment and mark those students

Questions that could help you developing a plan:

- * How high is your current energy use (electricity & gas) ?
- * Is there already some insulation?
- * Year your house was built

I would recommend you this time to use DUTCH websites, because those advises correspond best to the Dutch situation. Visit for example <https://www.milieucentraal.nl/> and <https://www.verbeteruwhuis.nl/>

Planning:

Lesson 1: Demos & Theory on Transport of Energy (conduction, convection, radiation)



Lesson 2:

Preparation: Find out/ask your parents the following:

- * How high is your current energy use (gas and electricity)?
- * Is there already some insulation?
- * Year your house was built

During the lesson visit for

example <https://www.milieucentraal.nl/> and <https://www.verbeteruwhuis.nl/> , and make a list of options

Lesson 3:

Find some more information about the different options on your list and finally choose one (or two?) options. (for a maximum of 10,000 euro). Save interesting figures and websites! Create text for the first part of you poster: Current status.

Lesson 4:

Work on poster texts, images etc.

Make sure you at least finish "Current status", "Plan" and "How does it work" parts today.

Lesson 5:

Finish poster: Printing, cutting, pasting.

Lesson 6: Poster – Presentation

Schedule presentations (students are numbered. pr= student presenting his/her poster, the other two/three students are watching and listening)

Round	Time	Who where?	Who where?	Who where?	Who where?	Who where?	Who where?	Who where?	Who where?
1	13.40-13.45	1 pr. 2,3	4 pr 5,6	7 pr 8,9	10 pr 11,12	13 pr 14,15	16 pr 17,18	19 pr 20,21	22 pr 23
2	13.45-13.50	2 pr 3,4	5 pr 6,7	8 pr 9,10	11 pr 12,13	14 pr 15,16	17 pr 18,19	20 pr 21,22	23 pr 1
3	13.50-13.55	3 pr 2,4,5	6 pr 7,8	9 pr 10,11	12 pr 13,14	15 pr 16,17	18 pr 19,20	21 pr 22,23,1	
4	13.55-14.00	1 pr. 5,6	4 pr 8,9	7 pr 11,12	10 pr 14,15	13 pr 17,18	16 pr 20,21	19 pr 23	22 pr 2,3
5	14.00-14.05	2 pr 6,7	5 pr 9,10	8 pr 12,13	11 pr 15,16	14 pr 18,19	17 pr 21	20 pr 1,22	23 pr 3,4
6	14.05-14.10	3 pr 7,8	6 pr 10,11,5	9 pr 13,14	12 pr 16,17	15 pr 19,20	18 pr 22,23,1	21 pr 2,4	

Part III Footprint

Assignment

Your own sustainability

0. Write your name on the assignment before handing in!

Calculating and comparing your footprint.

1. Calculate your own ecological footprint. Go to the Dutch site of the WWF ([De voetafdruktest. Hoe groot is jouw stukje aarde](#)). We use a Dutch footprint calculator because these questions correspond best to the Dutch situation.
2. How big is your own footprint?
3. Find the Dutch average footprint.
4. Is your (your) footprint large or small compared to the Dutch average?
5. Find the footprint of six other countries, from each continent one.
6. Compare the Dutch footprint to the footprint of those six countries and explain what might cause the difference.

Analyzing and improving your own footprint

7. Which parts make your footprint relatively large?
8. How could you change your way of life to make your footprint smaller? Name at least three ways to improve your lifestyle.
9. Which of the measures mentioned at question 8 are you willing to change? And why or why not?
10. How should you live to use no more than your 'fair share'?

Improving the footprint worldwide

11. What are the consequences if a species exceeds its capacity?
12. Why don't we notice that much that we already exceeded the capacity for a number of years? Or could we better say that only certain groups of people notice this? Who and where?
13. The term sustainable is often used in the sense of 'environmentally friendly'. This should therefore mean that people should use not more than 1.8 ha (and as humanity grows less and less). The Netherlands uses about 15x its own surface. Which surface should we use as a 'fair share'?
14. In particular the use of fossil fuels in particular makes the Dutch footprint so large. What measures could significantly reduce the footprint, without having to live in bitter poverty? Name at least three measures.

Planning:

Lesson 1: Watch "Ecological Footprint: Do we fit our planet?"

(https://www.youtube.com/watch?v=g_aguo7V0Q4&t=42s) and/or "Reducing ecological footprint" (<https://www.youtube.com/watch?v=YdijV0vya5Y>). Start

Assignment

Lesson 2: Finish assignment