Bio economy project for mavo-3 (version 1; 2022-2023[1])

Organisation:

Rotterdam University of Applied Sciences and Willem de Zwijger secondary school in Oud Beijerland

Country:

Netherlands

[1] In 2023-2024 version 2 will be released.

Background information

Topic:

Sustainable development, sustainable entrepreneurship, linear and circular economy, bio economy, creative solutions.

Narrative:

- A sustainable bioeconomy respects the planetary boundaries and recognises the societal challenges associated with the transition towards a circular and sustainable bioeconomy. Therefore, new approaches to shaping our relationship with nature are needed.
- Pupils need to understand at an early stage that the success of a sustainable and circular bioeconomy heavily depends on their behaviour as consumers and how we value what we buy and use on a daily basis.
- Without societal transformation and education about bioeconomy there will be no sustainable change. Teaching children about the value of biological resources is a crucial part of a transformation towards a sustainable society.

Relevance of topic:

Students of this age group are not so familiar with sustainability. To bring the theme closer, they will first be introduced in the need for a sustainable economy. They will talk about climate change, running out of resources, pollution, waste (e.g. plastics) and the (social) problems that arise as a result. After, they will see what a sustainable economy looks like; they see the difference between a linear and a circular economy and furthermore, they learn about an economy based on bio materials and the advantages of a circular bio economy for the planet and humanity. To see what the bioeconomy looks like in practice, students go on an excursion to Blue City, an innovative business center in Rotterdam, where start-ups work on creative solutions with bio resources. (1) After the visit to Blue City the students answer some questions about how they can reduce waste in their environment. (2) Students complete an assignment in which they propose solutions for consumer products from a producer perspective. They also make a costs and benefits estimation of these solutions.

Didactic model used:

The following 10 principles of learning for sustainable development are integrated in the assignments:

1. Student-centered
2. Connected to the daily life and the immediate living environment of the student.
3. Forward-looking.
4. Action-oriented (together, participation) and works on the development of action competence.
5. Promotes critical thinking, logical reasoning and the ability to make moral judgments.
6. Value-oriented.
7. Complexity as a challenge. Systemic thinking is a starting point.
8. Participation, both in the classroom and in situations that are authentic to students.
9. Benefits from an inquisitive attitude of pupils.
10. A regulatory idea (a normative ideal).

These principles culminate in 6 design criteria:

1. Learner-oriented
2. Value-oriented and focused on critical thinking
3. Participation and cooperation
4. Action- and action-oriented
5. Complexity and coherence
6. Inquisitive attitude

EU Mission: European Green Deal

SDG: 12 Responsible Consumption and Production, 13 Climate Action, 14 Life Below Water, 15 Life on Land

Age group: Secondary education 3rd year (14-15 years)

Curriculum: sustainable development, sustainable entrepreneurship, bio economy, circular economy

The following themes are addressed by this Material:

	Interconnectedness ☐	**Interconnectedness** reflects the role of the biosphere and natural environments in human well-being and holistic health and the undisputed ecological interconnectedness of all living things.
	Outdoor learning ☒	**Outdoor learning** is active learning in the outdoors where participants learn through what they do, through what they encounter and through what they discover.
	Food Loop ☒	**Food Loop** encompasses farming, hospitality, retail, and energy production sectors. In terms of the circular economy, it focuses on the efficient use of by-products, and the overall reduction of food waste.
	Forestry ☐	Whilst **forestry** products are increasingly attractive in terms of sustainability, and are a major part of the circular economy, there are massive global disparities in the governance of forestry activity.
	Life Below Water ☐	**Life below water** refers to the conservation and sustainable use of all water bodies (like oceans, and marine resources but also rivers and lakes) for sustainable development.

Table of Contents

1. Learning goals

The future is a circular and bio-economy. We approach the theme of sustainable entrepreneurship from three angles:
- Why sustainable development and sustainable business?
- What is sustainable entrepreneurship in the bioeconomy?
- How can you do sustainable business in the bioeconomy?

Learning objectives:
The learning objectives of the first lesson are:

- The student can name and explain what sustainable development, sustainable entrepreneurship and bio-economy is (Bloom: remembering and understanding).
- The student can explain why a linear economy is no longer sustainable and why a circular and bio-economy is the future (Bloom: understand).
- The student can recognize the 17 SDGs and explain them (Bloom: remember and understand).

The learning objectives of the second lesson/excursion are:

- The student is able to distinguish and assess what can or cannot be improved in his or her living environment in the field of sustainable development (Bloom: analyse and evaluate).
- The student can come up with creative solutions for the areas of improvement from the consumer's point of view (Bloom: create).

The learning objectives of the third lesson are:

- The student can develop a creative solution from the position of the producer (Bloom: create).
- The student can make a cost-benefit calculation (Bloom: apply).
- The student can present and explain the solution to the classmates (Bloom: apply).

2. Time requirement

Activity 1 Title: Lesson 1					
Time (min)	Learning Type	Content	Method	Media/Tools	Instructions for students
Estimated preparation time: …xx.. hours/minutes					
Total amount of time estimated for this unit: 50 minutes					
15		The learning objectives of the first lesson are: - The student can name and explain what sustainable development, sustainable entrepreneurship and bio-economy is (Bloom: remembering and understanding).	Teaching-learning conversation about the consequences of climate change, biodiversity degradation, environmental pollution, scarcity of raw materials.		Students make use of the website: Bio economie voor mavo drie (jouwweb.nl)
10			Students will calculate their own carbon footprint.	https://www.milieucentraal.nl/klimaat-en-aarde/klimaatverandering/wat-is-je-co2-voetafdruk/	
15	…	- The student can explain why a linear economy is no longer sustainable and why a circular and bio-economy is the future (Bloom: understand).	Viewing assignment with video.	https://schooltv.nl/video/economie-voor-het-vmbo-afl4-duurzaam-produceren/	After watching the video, students will work in groups to answer questions about the consequences of producing in the old way. Why is a change necessary? What is sustainable production? The outcome will be discussed in class.

10		- The student can recognize the 17 SDGs and explain them (Bloom: remember and understand).	Play the game 'Go Goals SDG game'	https://bio-economie-voor-mavo-drie.jouwweb.nl/les-1/kennisbank/spel-go-goals-sdg-game	
Activity 2 Title: Lesson 2: excursion Blue City					
Time (min)	Learning Type	Content	Method	Media/Tools	Instructions for students
Estimated preparation time: …xx.. hours/minutes					
Total amount of time estimated for this unit: excursion is 60 minutes; assignment in the bus: 20 minutes					
60	*Excur-sion*	- The student is able to distinguish and assess what can or cannot be improved in his or her living environment in the field of sustainable development (Bloom: analyse and evaluate).	The second lesson starts with a visit to BlueCity. The students will see all kinds of companies that are working on circular and bio-economy. It will make the students think that things can be done differently.		Students make use of the website: Bio economie voor mavo drie (jouwweb.nl)
20		- The student can come up with creative solutions for the areas of improvement from the consumer's point of view (Bloom: create).	Out of the box thinking	We make cards with the starting phrase: "What would happen if…?" The sentence is supplemented with something we discussed in the first lesson. For example, "What would happen if we banned plastic?" "What would happen if the oil runs out?". Then we draw cards and a	We carry out this teaching method in the bus, on the way back to school after the visit to BlueCity.

				number of students answer this question. Other students can then respond to it.	
Activity 3 Title: Lesson 3					
Time (min)	Learning Type	Content	Method	Media/Tools	Instructions for students
Estimated preparation time: …xx.. hours/minutes					
Total amount of time estimated for this unit: excursion is 50 minutes					
		- The student can develop a creative solution from the position of the producer (Bloom: create). - The student can make a cost-benefit calculation (Bloom: apply). - The student can present and explain the solution to the classmates (Bloom: apply).	The third and last lesson, the students will investigate what can be improved in their own living environment and at school in the field of sustainability. The teacher encourages the students to come up with creative angles and solutions for product design. They also prepare a cost-benefit calculation for this product.	For the research, the students use Google Forms.	Students make use of the website: Bio economie voor mavo drie (jouwweb.nl) The students prepare a presentations for their classmates, in which they present a creative solution for a product in a sustainable way.

3. Assessment

Students write a personal review about what they learned in the series of lessons and how they (can) apply it in their personal life.

4. Supporting materials

This is the website (in Dutch) that is developed for the students of Mavo 3. Students use the website to prepare themselves for the excursion to Blue City and the assignment they have to do there and afterwards.

Bio economie voor mavo drie (jouwweb.nl)

Using a website, we save on paper books and notebooks.

Videos on YouTube to explain the concepts of sustainability, bioeconomy, sustainable development, linear and circular economy: in Dutch:

- Bram Wondergem about sustainable development: https://youtu.be/mhCFgWBtOp4
- Explanation bio economy: https://youtu.be/hWVr_aTOXE4
- Explanation circular economy: https://youtu.be/dnP3WKLG7Bw
- Difference linear and circular economy (in English): https://youtu.be/8CKmDX0P8gg

Examples of sustainable entrpreneurship:

- Kartent in collaboration with Smurfit Kappa: https://youtu.be/cvY9AUjFvnY
- SophieGreen: nature-friendly cleaning product: https://youtu.be/C5yuCaH1WKY
- Bert van Son of MUD Jeans talks about circular jeans: https://youtu.be/9XtI2OGQ23Q
- A look behind the scenes at Fairphone: https://youtu.be/vmtaWQxBYFk

5. Literature and links

BlueCity: circulaire voorbeeldstad in vervallen zwembad in Rotterdam. (2023b, maart 6). BlueCity. https://www.bluecity.nl/

De Wolf, M., Smit, E., & Hurkxkens, P. (2018). *Lesgeven over duurzame ontwikkeling: didactische handreiking /Martin de Wolf, Eefje Smit en Peter Hurkxkens*.

Economie VMBO: SYLLABUS CENTRAAL EXAMEN 2023. (2021, 21 juni). https://www.examenblad.nl/examenstof/syllabus-economie-vmbo-2023/2023/vmbo-tl/f=/economie_vmbo_versie_2_2023.pdf

Evie Blue - The perfect blend of quality, sustainability and efficiency. (2021, 8 maart). The perfect blend of quality, sustainability and efficiency. https://evieblue.nl/

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Ministerie van Buitenlandse Zaken. (2017, 27 februari). *Sustainable Development Goals: Werelddoelen voor duurzame ontwikkeling*. Ontwikkelingssamenwerking | Rijksoverheid.nl. https://www.rijksoverheid.nl/onderwerpen/ontwikkelingssamenwerking/internationale-afspraken-ontwikkelingssamenwerking/global-goals-werelddoelen-voor-duurzame-ontwikkeling

Van, E. R. M. &. T. (2020b). *De herziene taxonomie van Bloom in de klas*.

6. Annex

The teaching material is in line with the attainment targets for the economics course VMBO-TL. These are listed in the syllabus central exam 2023 (version 2).

Sustainability can be found in two domains:

- Firstly, in the EC/K/4A DOMAIN CONSUMPTION, CONSUMER BEHAVIOUR, BASIC MONEY AND BANKING, BUDGETING.

''The candidate has insight into aspects of consumer behaviour, such as choices, needs, income and into the functions of money, borrowing and saving, and can apply this insight to a given case. In view of his/her role as a consumer, the candidate can: describe the difficulties of choice in different forms of consumption, which may arise due to scarcity of resources and time and due to differences in urgency of needs.

He/she involves ...

Examples of self-sufficiency, purchasing, collective facilities, use of nature:
- self-sufficiency: production for one's own needs, production for family needs
- buying: companies that produce for needs - public utilities: the government produces for needs
- use of natural resources: e.g. consumption of raw materials, breathing fresh air, recreation in nature, sustainability".

- Secondly, we find sustainability in the domain of EC/K/5A LABOUR AND PRODUCTION, PRODUCTION AND BUSINESS.

"The candidate has insight into aspects of producer behaviour such as costs, revenues, profit, added value, labour, division of labour, labour productivity, employment, unemployment and can apply this insight to a given case.

Under 6 it says: describe in various situations of production that there are problems of choice in the weighing of costs versus benefits in the narrower sense and in the weighing of social costs and benefits, corporate social responsibility (CSR) as a way of doing business, including sustainability, taking into account any external effects and other undesirable matters (exploitation, child labour, etc.):

– the candidate knows that there is a difference between operating costs (part of the sales price) and the costs/revenues that are not included in the sales price
– the social costs/benefits are sometimes difficult or impossible to quantify in monetary terms
– production and consumption may have positive or negative effects that are perpetrated by others than those who caused them'.

7. Impressum

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