Project Number: 2019-1-PL01- KA201-065027

Guidelines for Teachers

Developed in the framework of the European project

CLIL for STEAM

Project number: 2019-1-PL01- KA201-065027

Authors:

Letizia Cinganotto, Fausto Benedetti and Maria Guida

Università Telematica degli Studi

Marie Walsh, Rita Scully

Technological University of the Shannon

Co-funded by the Erasmus+ Programme of the European Union

The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

CLIL for STEAM
Project Number: 2019-1-PL01- KA201-065027

Contents

Co-funded by the Erasmus+ Programme of the European Union

The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

CLIL for STEAM
Project Number: 2019-1-PL01- KA201-065027

Introduction to CLIL in STEM

Introduction to CLIL in STEM
In this area some theoretical and methodological inputs will be provided in order to define the framework of reference for CLIL activities in STEM.

Introduction to the CLIL approach in teaching STEM

CLIL is an umbrella approach, entailing the learning of content in a foreign language, through a wide range of techniques and strategies, aiming at making the students the protagonists of their learning pathway. CLIL is particularly effective in STEM (Science, Technologies, Engineering, Math), as these subjects generally make use of simulations, experiments and laboratory activities, which can really make authentic and meaningful the use of the language for CLIL tasks.

Effective CLIL methodologies

CLIL methodology takes advantage of a wide range of teaching strategies and techniques, aimed at fostering the meaningful use of the foreign language in a CLIL-oriented environment, in order to manipulate and co-construct content and knowledge, particularly effective with STEM.

Some of the main methodologies adopted in CLIL will be mentioned in this paragraph, with no ambitious to be exhaustive:

- **Problem-Based Learning**

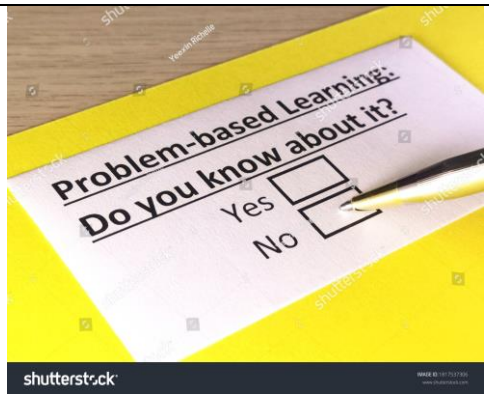
Problem-Based Learning (PBL) is a teaching method aimed at promoting the development of critical thinking skills, problem-solving abilities, and communication skills. It also provides opportunities for working in groups, finding and evaluating research materials, starting from a real-world problem.

Any subject area can be adapted to PBL. Some of the key principles of PBL can be adapted to any subjects and fields and could also be used for transdisciplinary or cross-disciplinary activities (Duch, Groh, and Allen, 2001):

- The problem must motivate students to seek out a deeper understanding of concepts.
- The problem should require students to make reasoned decisions and to defend them.
- The problem should incorporate the content objectives in such a way as to connect it to previous courses/knowledge.
- If used for a group project, the problem needs a level of complexity to ensure that the students must work together to solve it.
- If used for a multistage project, the initial steps of the problem should be open-ended and engaging to draw students into the problem.

The main idea of PBL is to help students find their own resources to solve the real-world problem given. This can be very effective in CLIL for STEM.

Co-funded by the Erasmus+ Programme of the European Union



- **Project-Based Learning**

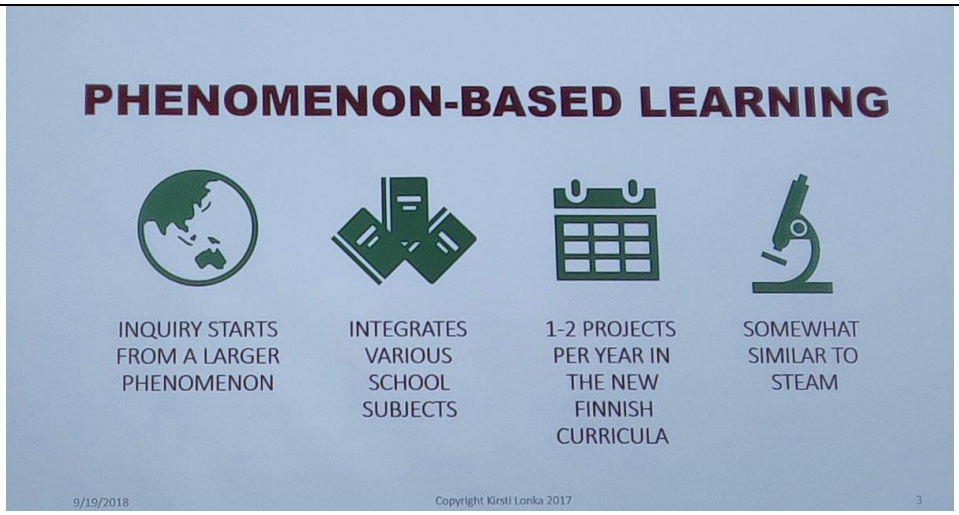
Project Based Learning (PBL) is a teaching method in which students learn by actively engaging in real-world and personally meaningful projects, responding to an authentic, engaging, and complex question, problem, or challenge.

PBLWorks, Buck Institute for Education, distinguishes between a "dessert project", a short, intellectually-light project served up after the teacher covers the content of a unit in the usual way and a "main course" project, in which the project *is* the real unit, that is the vehicle for teaching the important knowledge and skills student need to learn.
In the infographic below, the key elements of PBL are highlighted:

- **Phenomen-Based Learning**

Phenomenon-based learning is a learner-centred, multidisciplinary instructional approach that is based on student inquiry and problem solving. It is not focused on a specific subject, or on preset learning objectives. On the contrary, learners are supposed to investigate and solve their own questions by applying subject knowledge and skills, which are relevant to that particular phenomenon to investigate or problem to solve. It comes from Finland, where it has become an integral part of the school curriculum, according to the latest school reform.

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.



Online Resources for Paragraph 1

- ***What is PBL?***

https://www.pblworks.org/what-is-pbl
This website**,** PBLWorks, Buck Institute for Education, provides interesting examples of PBL in CLIL for STEM.

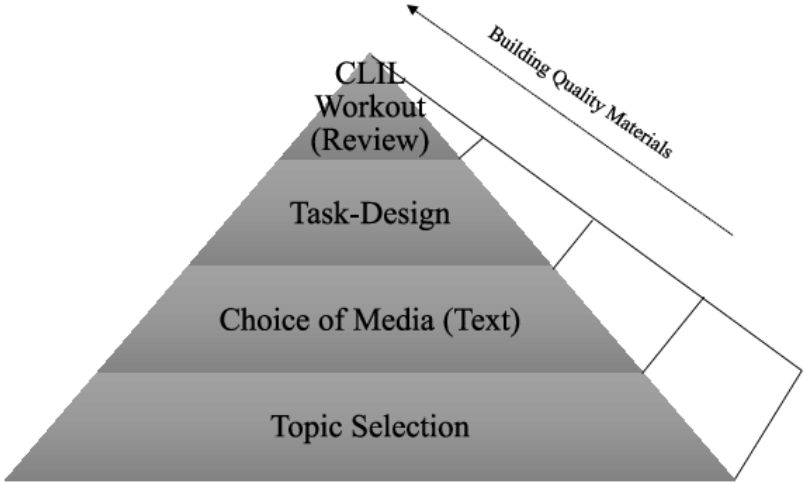
- ***What is Finland's Phenomenon-based Learning approach?***

https://www.teachermagazine.com/au_en/articles/what-is-finlands-phenomenon-based-learning-approach
This article can be useful to understand Ph-based learning and its application in a CLIL for STEM pathway.

Designing materials and tasks for CLIL lessons

One of the most famous framework for designing materials and tasks for CLIL lessons is the CLIL pyramid by Oliver Meyer, in the picture below.

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.



According to Meyer (2011) "Video clips, flash-animations, web-quests, podcasts or other interactive materials on English websites combine motivating and illustrative materials with authentic language input. They constitute a rich source for designing challenging tasks that foster creative thinking and create opportunities for meaningful language output."

Tips for teachers

When designing materials and tasks for CLIL lessons a teacher should:

- start by selecting the topic that will be dealt with in the CLIL pathway
- choose suitable media according to a multimedia modality which is one of the main features of CLIL: not only written or oral texts, but also infographics, images, videos, podcasts etc.
- assign a CLIL task to the students, entailing the use of the language for meaningful CLIL activities.
- CLIL workout: sharing the students' outputs that can take the shape of an oral or written presentation, a paper or digital poster, or other products to be presented to the teacher and to the class in the foreign language.

A very useful self-assessment tool for teachers as a starting point of a CLIL pathway can be the checklist "How CLIL are you?" by Dale and Tanner (2012):
http://ateneu.xtec.cat/wikiform/wikiexport/_media/cmd/lle/clsa/modul_6/checklist_how.pdf

See Example A for a worked example

Online Resources for Paragraph 2
- ***CLIL Lesson Planning in Primary Education: a case study*** http://www.tesol-spain.org/uploaded_files/files/CLIL%20Lesson%20Planning%20in%20Primary%20Education%20a%20case%20study.pdf An example of application of the CLIL pyramid - ***Towards Quality CLIL -Oliver Meyer´s article of Successful Planning and Teaching Strategies*** *https://merjamerilainen.files.wordpress.com/2013/01/towards-quality-clil.pdf* A review of the article on the CLIL pyramid by O. Meyer.

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

The role of scaffolding in CLIL

Scaffolding is particularly important in a CLIL class, especially with STEM subjects. It refers to all the strategies and techniques used by the teacher to guide the students towards progressive autonomy in the learning process and towards a gradual better mastery of both content and language implied in the CLIL pathway.
As scaffolding techniques, here are some examples:

- Images
- Videos
- Infographics
- Diagrams
- Maps
- Graphic organizers
- Semantic web
- Webtools for simplifying/checking/explaining the language
- Webtools for simulations
- Etc.

According to Patrick de Boer[1], here are some suggestions for effective scaffolding both in terms of the language and the learning:
Focus on language
When you ask a student to explain something, provide him/her with sentences to be used in the explanation. This will help students who are not sure about their language to focus on the content explained instead of worrying about the words to be used.
Provide example questions for your students to ask in case they don't understand something. This can also be combined with tasks that require students to come up with questions on their own.
Focus on learning
Create a framework students can fill out to structure your instruction. This might be a gapped text during a listening exercise or a partially filled in worksheet your students need to complete.
Explain how to tackle a different exercise. Not by doing it for them (that's helping!) but by providing them with the steps to follow. If at any point students can't seem to figure out what to do, you can point to the steps and ask if these have been followed.

In this article you can find some inputs about CLIL in Mathematics:
https://www.clilmedia.com/clil-and-mathematics-3-ways-to-improve-this-challenging-combo/

Online Resources for Paragraph 3

- ***How scaffolding can improve your CLIL lessons***

https://www.clilmedia.com/how-scaffolding-can-improve-your-clil-lesson/
Some examples of CLIL scaffolding.

- ***Scaffolding in education. Providing language support in CLIL***

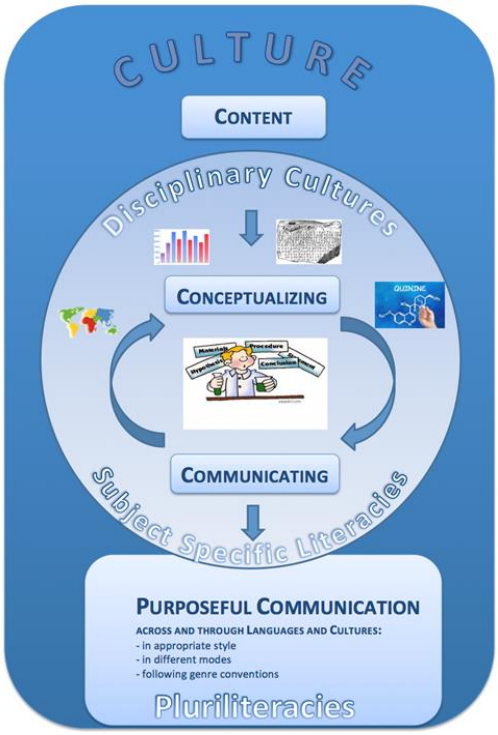
https://ita.calameo.com/read/0019126473278ee9d8f30
A publication on scaffolding by J. Clegg

[1] https://www.clilmedia.com/

Co-funded by the Erasmus+ Programme of the European Union

Pluriliteracies and CLIL

A recent illuminating interpretation of CLIL is offered by the Graz Group at the European Centre for Modern Languages (ECML) (Coyle, Meyer, 2021; Meyer, Coyle, 2017; Cinganotto, Cuccurullo, 2019). The project, coordinated by Oliver Meyer, Do Coyle and Kevin Schuck, is titled "Pluriliteracies Teaching for Deeper Learning" (PTL) and is aimed at fostering the wide range of literacies (subject literacies, language literacies, digital and transversal literacies) our students need in order to meet the challenges of 21st century. The model aims at building up a "learning ecology" in class, involving all the different stakeholders in an active way: students are the protagonists of the learning pathways, with all their expectations, emotions and anxiety, which we should take into account where the teacher plays the role of a coach or mentor, scaffolding the learning process in order to guide learners towards progressive autonomy starting from a novice level to a mastery level of learning.
PTL is aimed at designing a wider interpretation of CLIL, considering the 21st century skills, the global competences and literacies.
The image below describes the interconnections of the 4Cs by Do Coyle (Communication, Content, Cognition, Culture) which are the pillars of CLIL with subject literacies and all the other literacies (pluriliteracies) which are relevant for a purposeful communication.



In this document "Putting a PTL approach into practice" some inputs on how to implement a PTL approach are provided:
https://pluriliteracies.ecml.at/Portals/54/publications/pluriliteracies-Putting-a-pluriliteracies-approach-into-practice.pdf

Online Resources for Paragraph 4

- ***Pluriliteracies***

https://pluriliteracies.ecml.at/
PTL ECML website.

- ***PTL video***

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

https://www.youtube.com/watch?v=QSQisLoOcQE
The official video of the PTL model.

References

- Cinganotto L., Cuccurullo D. (2019). "A Pluriliteracies Approch to CLIL", LUBLIN STUDIES IN MODERN LANGUAGES AND LITERATURE,43(3), 2019.
- Cinganotto L. (2019). "Pluriliteracies and LOCIT for CLIL", Innovation in Language Learning 2019, Pixel, Conference Proceedings.
- Cinganotto, L. (2018). "Apprendimento CLIL e interazione in classe", Aracne.
- Cinganotto, L., Cuccurullo, D. (2019). "Techno-CLIL. Fare CLIL in digitale", Quaderni della Ricerca n. 42, Loescher.
- Coyle, D., Hood, P., Marsh, D. (2010). "CLIL: Content and Language Integrated Learning", Cambridge University Press, Cambridge.
- Coyle, D., Meyer O. (2021). "Beyond CLIL", Cambridge University Press.
- Dale and Tanner (2012). "CLIL activities", Cambridge University Press
- Duch, B. J., Groh, S. E, & Allen, D. E. (Eds.). (2001). "The power of problem-based learning". Sterling, VA: Stylus.
- "Finnish National Board of Education. (2016). New national core curriculum for basic education: focus on school culture and integrative approach". Retrieved from https://www.oph.fi/sites/default/files/documents/new-national-core-curriculum-for-basic-education.pdf
- Meyer, O. (2011). "Introducing the CLIL-Pyramid: Key Strategies and Principles for CLIL Planning and Teaching". In: Eisenmann, Maria ; Summer, Theresa (Hrsg.): Basic Issues in EFL Teaching. – Heidelberg : Universitätsverlag Winter, 2011. – S. 295-313.
- Nikula T. (2015). "Hands-on tasks in CLIL science classrooms as sites for subject-specific language use and learning", System (2015).
- Meyer, O., Coyle, D. "Pluriliteracies Teaching for Learning: Conceptualizing Progression for Deeper Learning in Literacies Development", in European Journal of Applied Linguistics, 5, 2, 2017.

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

CLIL for STEAM
Project Number: 2019-1-PL01- KA201-065027

Criteria for high-quality learning material for CLIL in STEM subjects

Criteria for high-quality learning material for CLIL in STEM subjects

In this area some criteria for high-quality learning material for CLIL in STEM subjects will be provided, also mentioning some theoretical models from the literature.

Criteria for high-quality CLIL material: theoretical frameworks

CLIL materials are difficult to find as ready-made. In fact, materials need to be reshaped and manipulated according to the students' level of competence and learning style. That is why some given criteria for identifying, planning and manipulating CLIL content and materials with reference to STEM subjects would be helpful for a successful CLIL pathway.

Criteria for high-quality CLIL material: theoretical frameworks

According to Banegas (2017), teachers should assume a more active role by developing their own context-responsive materials individually or as a team. In this way, materials development can become an opportunity for collaborative professional development and for a better understanding of the underlying principles of CLIL.
Ball, Kelly and Clegg (2015) offer a lot of inputs for identifying and creating high-quality CLIL material.
According to Mehisto (2012) "CLIL materials must conform to the general norms of published student learning materials such as ensuring that they avoid stereotyping, support the development of environmentally sound practices, and foster inclusion. It is the capacity to maintain and apply a multiple focus not only on content, language and learning skills – a challenge in and of itself – but also the application of other CLIL-specific and generally accepted education criteria which are central to the development of quality CLIL learning materials".

In particular, Mehisto identifies ten criteria for producing quality CLIL materials, which can be used as a checklist for teachers when selecting/ designing materials:
(1) make the learning intentions (language, content, learning skills) & process visible to students,
(2) systematically foster academic language proficiency,
(3) foster learning skills development and learner autonomy,
(4) include self, peer and other types of formative assessment,
(5) help create a safe learning environment,
(6) foster cooperative learning,
(7), seek ways of incorporating authentic language and authentic language use,
(8) foster critical thinking,
(9) foster cognitive fluency through scaffolding of a) content, b) language, c) learning skills development helping student to reach well beyond what they could do on their own,
(10) help to make learning meaningful.
Here is the detail of the first of the 10 criteria for Quality CLIL material defined by Mehisto:

Co-funded by the Erasmus+ Programme of the European Union

Make the learning intentions (language, content, learning skills) & process visible to students	
For example: **Content** 1. You can name in writing the fifteen major tectonic plates 2. You can explain how tectonic plates affect one another	Make up the earth's crust Form major tectonic plates To be in constant movement Pass each other Collide into each other Move under (on top of) each other Melt into molten rock/become magma Release gases Cause volcanic eruption
Language 3. You can use analogies in scientific descriptions, including explaining their limitations	To move as slowly as fingernails grow Shield volcanoes resemble a Roman soldier's shield lying on the ground. They are, however, much wider and taller.
Learning Skills 4. You will be able to summarise other students' ideas	'MJ predicts that the next level-seven eruption will occur in Italy in […], because on average there is a level-seven eruption every […] years'
NB: It is important to break intended learning down into short and long-term planned outcomes that are incorporated into learning materials. Furthermore, quality CLIL materials draw links between planned short and long-term language, content and learning skills outcomes. It is also expected that learning outcomes are realistic, but challenging.	

Online Resources for Paragraph 1

CLIL didactic sequences and materials
http://www.juntadeandalucia.es/educacion/webportal/web/aicle/secuencias-aicle

CLIL activities, blogs, and wikis
http://www.isabelperez.com/clil/clicl_m_6.htm

References (for the whole area)

- Ball P., Kelly, K., & Clegg, J. (2015). "Putting CLIL into practice". Oxford: Oxford University Press.
- Banegas, D. L. (2017). "Teacher developed materials for CLIL: Frameworks, sources, and activities". Asian EFL Journal, 19(3), Retrieved from https://www.elejournals.com/1590/2017/asian-efljournal/the-asian-efl-journal-quarterly-september-2017/
- Mehisto P. (2012). "Criteria for producing CLIL learning material", Encuentro 21, 2012, ISSN 1989-0796, pp. 15-33.

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

CLIL for STEAM
Project Number: 2019-1-PL01- KA201-065027

Guidelines on how to identify, plan and implement learning resources for CLIL in STEM subjects within a CLIL Learning Scenario

Guidelines on how to identify, plan and implement learning resources for CLIL in STEM subjects within a CLIL Learning Scenario
In this area some guidelines on how to identify, plan and implement learning resources for CLIL in STEM subjects within a CLIL Learning Scenario or pathway will be provided.

Guidelines on how to identify, plan and implement learning resources for CLIL in STEM subjects within a CLIL Learning Scenario
A CLIL Learning Scenario should be planned in details from the planning to the implementation and the assessment of all the activities, following the multimodal approach which is typical in CLIL to process inputs.

Planning and implementing a CLIL Learning Scenario

Jason Skeet (2016) suggests a «three course meal approach to CLIL lesson planning», (see Cinganotto, 2021):

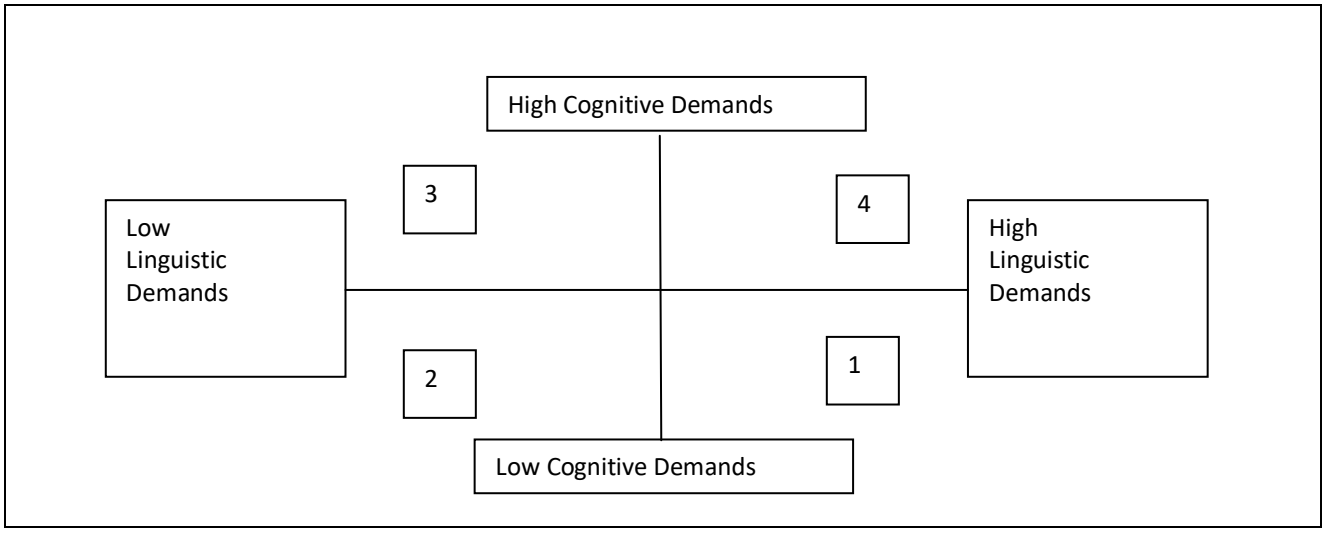
- *Starter*: warm-up and brainstorming
- *Main course:* task planning and performance
- *Dessert*: reflection and meta-cognition.

Do Coyle's planning tool can be very useful, as it allows to plan a CLIL learning scenario according to the 4Cs (Content, Communication, Cognition, Culture), as in the table below:

4Cs Planning Grid			
Schools:		**Topic:**	
Content (1)	Cognition (3)	Culture (4) →	Communication (2) →
• Teaching aims: • Learning Outcomes • List content to be taught	• Thinking skills (content determined) • Other thinking skills: • Learning skills • Questioning • Class activities: (eg. G work • Scaffolding)	• Connect to topic: • Other cultural elements:	• Content language: (key words, phrases) • Thinking/learning to learn language • Scaffolding • Organizational language • Other:

Coyle's planning tool is based on a proper balance between the linguistic demand and the cognitive demand of the task, as shown below:

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.



What follows is the planning tool suggested for CLIL4STEM Learning Scenarios:

Teacher's Name and Surname	
Country	
Name of the School	
Students' Age	

Title	*Please indicate the title of the case scenario*	
Subject	☐ Math ☐ Physics ☐ Biology	☐ Technology ☐ Chemistry ☐ Arts
Topic		
Students' target level of competence (CEFRCV)	☐ A1 ☐ A2 ☐ B1 ☐ B2 ☐ C1 ☐ C2	
Learning objectives (related to curriculum content)	*What we aim to achieve with the learning scenario*	
Learning outcomes	Students will be able to: *This field is dedicated to describe how the students is able to apply the learning objectives*	
Cognitive skills		
Language Function		
Language Skills	☐ Listening ☐ Speaking ☐ Interaction ☐ Reading ☐ Writing	
Key language	**Vocabulary:** **Verb:**	

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

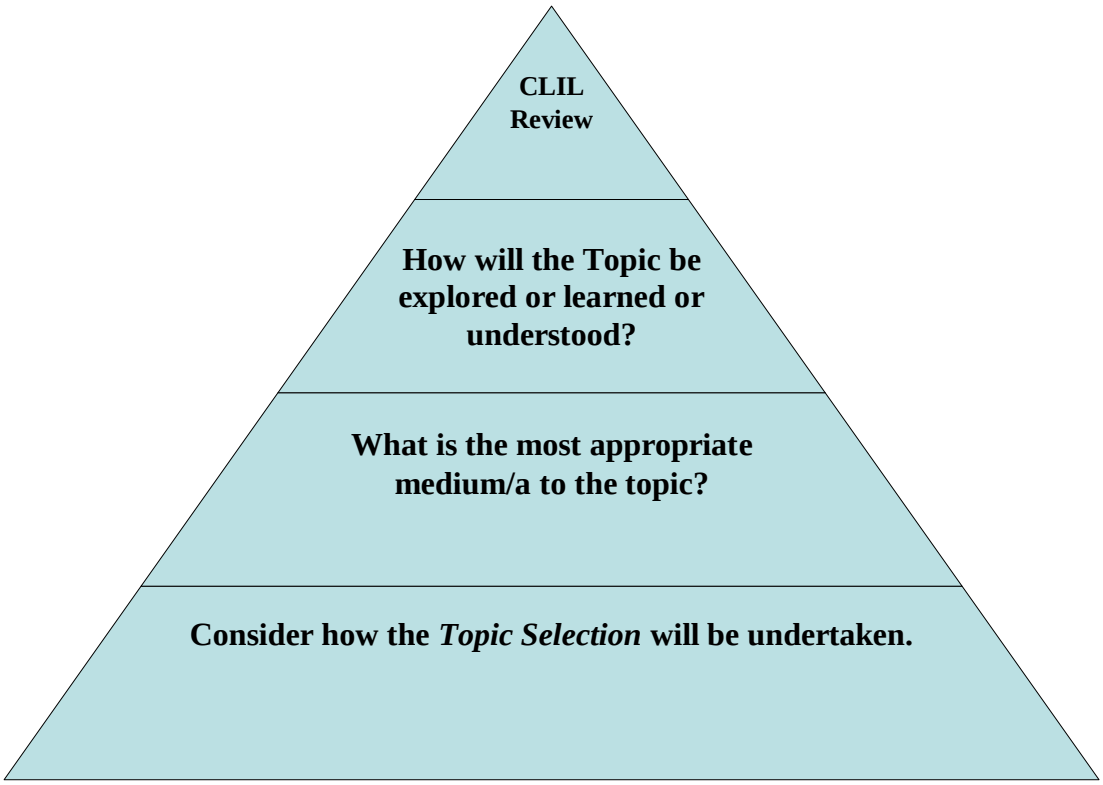
	Language structure:
Material, resources, webtools	*Please consider to make reference to the CLIL4STEAM video library and to the reviewed and created Teaching Resources*
Activities	*Please describe the activities to be carried out in order to put in practice the Learning Scenario*
Assessment FOR learning **Assessment OF learning**	

Online Resources for Paragraph 1
- **CLIL planning tools for teachers by Do Coyle (2005)** https://www.unifg.it/sites/default/files/allegatiparagrafo/20-01-2014/coyle_clil_planningtool_kit.pdf

References (<u>for the whole area</u>)
- Cinganotto L. (2021). "CLIL & Innovazione", Pearson. - Graziano A., Turchetta B., Benedetti F., Cinganotto L. (2021) (edited by). Pedagogical and Technological Innovations in (and through) Content and Language Integrated Learning, Cambridge Scholars Publishing. - Skeet J., "On Three Principles for CLIL Lesson Planning", 2016: https://www.academia.edu/30315651/On_three_principles_for_CLIL_lesson_planning

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

EXAMPLE A – Worked Example



This table presents a possible approach to the CLIL Review, incorporating digital tools that will aid both teaching, learning and assessment. The topic selected for the example is Renewable Energies.

CLIL Stages	Considerations	Outcome
CLIL Review	What worked – How can that be improved What failed – How can that be addressed	Building on the aspects and technologies that worked and expanding them into other weaker areas
Task-Design	**Introduction Stage:** • Wordcloud or Mentimeter app of what the students think of in relation to that topic • Overview video or documentary • Incidence or occurrence of a relevant outcome to the topic (flooding links to Greenhouse effects; solar panels links to Renewable Energies) **Core Stage:** • Group or individual exploration of the topic • Class projects to explore aspects of the topic	**Introduction Stage:** • List of prompt words available to promote discussion • Source an overview video from CLIL resources or elsewhere • Prepare a list of examples or relevant occurrences of **Renewable Energies** **Core Stage:** • Consider how best to have students involved: individual work, select own groups, assigned to groups, mix up groups for each stage • Format of class project – paper, electronic, mixed options • Format of class Presentations or

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

	• Presentations/demonstrations back to the class on aspects of the topic	demonstrations back to the class – recorded/live, etc.
Choice of Media	Combination of Media types can be considered: • What are the facilities available in the class or to individual students? • What is the students IT ability to engage with the media options? **Introduction Stage:** • Wordcloud or Mentimeter app • Overview video • Documentary **Core Stage:** • Electronic presentations – TikTok, Flipgrid, Zoom etc. • Electronic demonstrations • Existing electronic resources	Strong broadband in school and IT facilities in classroom. Students only going to be required to work individual and in groups in school over a period of 3 weeks. **Introduction Stage:** • Mentimeter app – wordcloud option for student input in what they associate with Renewable Energies • Review CLIL video 17 on Renewable Energies • From Wordcloud select 4 areas for students to research on **Renewable Energies** **Core Stage:** • Students give in class presentations on their researched areas • Students source 1 additional existing electronic resource in their area
Topic Selection	• A predetermined list by the teacher • Student selection from a range of options – encouraging discussion and debate on topics and order of the topics to be worked through • Game-oriented e.g. bingo or lottery, of the topics that each student has. Generating student investment in "their" topic.	• Student selection from a range of options using Mentimeter or similar app to make selections • Example for selection **Renewable Energies**

Online Resources for CLIL Review Example

Mentimeter: is a free live polling tool for engaging audiences of all sizes. Use live polls, Q&A and open responses to help you listen to your audience and enable everyone to contribute using their smartphones.
https://www.mentimeter.com/
Wordcloud: A word cloud (also known as a tag cloud) is a visual representation of words. Cloud creators are used to highlight popular words and phrases based on frequency and relevance. They provide you with quick and simple visual insights that can lead to more in-depth analyses.Wordclouds.com is a free online word cloud generator and tag cloud creator. Wordclouds.com works on your PC, Tablet or smartphone. Paste text, upload a document or open an URL to automatically generate a word- or tag cloud. Customize your cloud with shapes, themes, colours and fonts. You can also edit the word list, cloud size and gap size. Wordclouds.com can also generate clickable word clouds with links.
Flipgrid: Flipgrid is a website that allows teachers to create "grids" to facilitate video discussions. Each grid is like a message board where teachers can pose questions, called "topics," and their students can post video responses that appear in a tiled grid display. https://info.flipgrid.com/
TikTok: This social media platform is used to make a variety of short-form videos, from genres like dance, comedy, and education, that have a duration from fifteen seconds to three minutes. https://www.tiktok.com/en/
Zoom: Zoom can help engage students, faculty, and staff for learning, collaboration, and administration. Zoom supports remote and hybrid learning environments for primary and secondary schools, and higher education. https://zoom.us/education

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Bingo: Bingo is a classic game that can provide students with an engaging way to practice language skills. You can use the game to help students practice vocabulary, reading comprehension, and more. Several on-line sources offer templates for production of bingo cards.

Lottery: Similar to classroom bingo. Several on-line sources offer free templates. One source is at https://www.twinkl.ie/resource/t-e-137-school-lotto-game

Co-funded by the Erasmus+ Programme of the European Union

The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

CLIL for STEAM
Project Number: 2019-1-PL01- KA201-065027

Guidelines on how to assess a CLIL learning pathway in STEM subjects

Introduction

Assessment is the process of gathering, analyzing and interpreting evidence, reflecting on findings and making informed and fair judgements to improve student learning. It is important to distinguish the differences between evaluation and assessment: An evaluation is the (subjective) means to look back at a certain event or happening, of which the value is considered something worthy of checking. An assessment is the (objective) way of measuring a predefined set of knowledge, amongst other things. Assessment can be formative or summative.

Formative and summative assessment are best thought of as descriptions of the use of assessment information, rather than of the information itself, or the instruments that produce the information, according to Dylan Williams.

In general, assessment should aim to improve both learning and understanding and will conform to some or all of three general principles:

1. Assessment **for** learning
2. Assessment **as** learning
3. Assessment **of** learning

Figure 1 gives a useful summary of the distinctions between different types of assessment. It also shows how roles and responsibilities change depending on the type of assessment and introduces ideas like co-assessment, self-review and peer review. The requirement for critical evaluation and comparison with exemplars is also introduced.

The duality of Content and Language Integrated Learning (CLIL) implies that there may be different assessments for language and subject knowledge. Three possible assessment scenarios arise: assessment focuses more on subject knowledge and competence and less on the foreign language competence; or assessment focusses on the communicative competence in English; or there is an integrated assessment of language and subject content (Massler *et al*., 2014). While an integrated approach to assessment of both content and language learning may be employed it presents some challenges. Kiely advocates the development of frameworks that guide teachers in their planning and pedagogic strategies and support them in using those to shape schemes of work, lesson plans, worksheets, responses to written work, and especially in micro-interactions with students in CLIL classrooms.

Panuela *et al*. state that “Designing and carrying out CLIL assessment is a demanding and complex endeavour whether the purpose is formative, summative or purely diagnostic. It seems clear that teachers and schools require support from the community of applied sciences and materials developers if they are to consolidate existing CLIL implementation calls for continuity across levels and assessment principles.”

Assessment of Learning (Summative Assessment)	**Assessment For/As Learning (Formative Assessment)**
Happens after learning takes place	Built in to the learning process
Information gathered by teacher	Information is shared with learner
Information is usually translated into grades or marks	Information is given on quality of learning - feedback
Compares performance with others	Is linked to learning intentions and success criteria
Looks back on past learning	Looks forward to the next stage of learning

Table 1: Summary of differences between Assessment Typologies

Co-funded by the Erasmus+ Programme of the European Union

Figure 1: Summary of Assessment Typologies

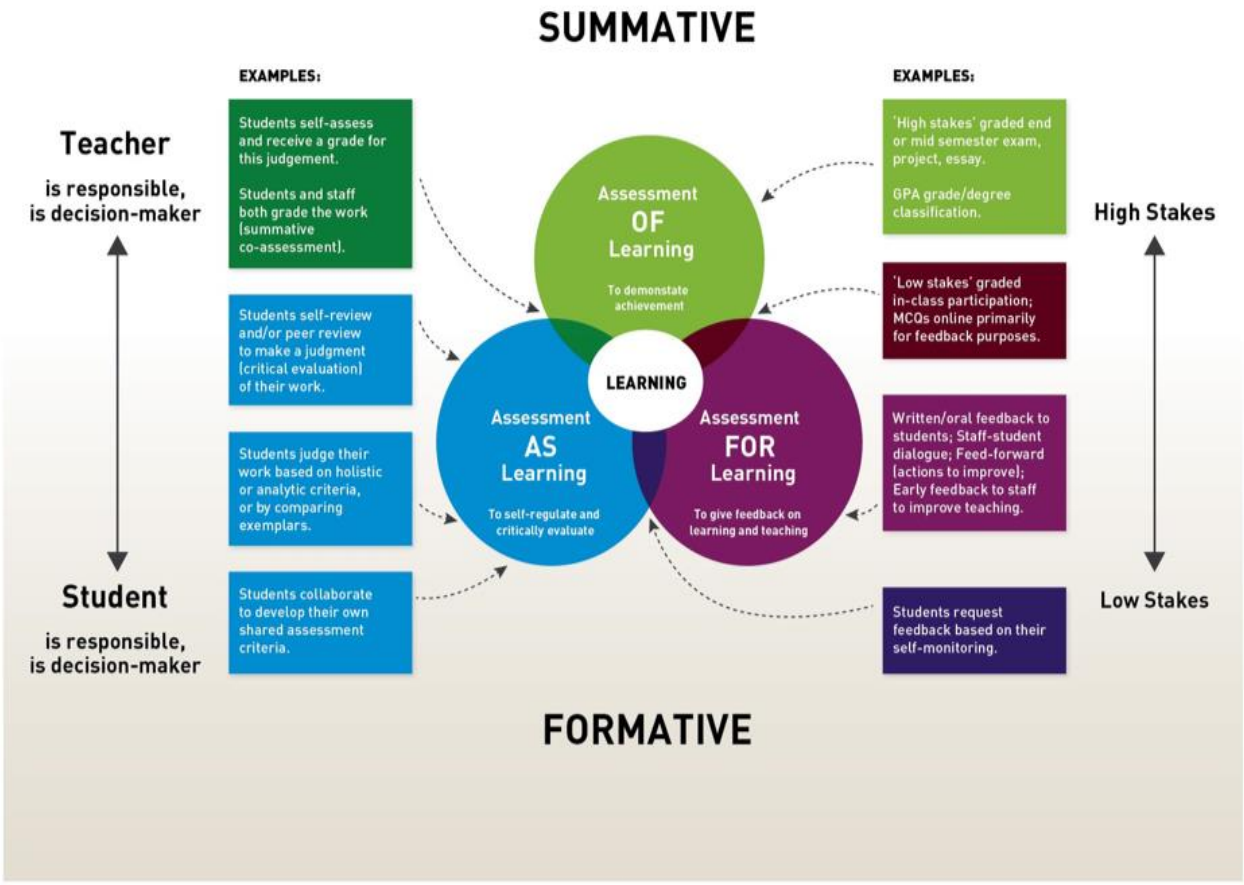


Figure 1: Comparison of Assessment Typologies and Outcomes.

Source: National Forum for Teaching and Learning

https://www.teachingandlearning.ie/our-priorities/student-success/assessment-of-for-as-learning/#!/Principles

Online Resources for Introduction

Presentation: CLIL6 Assessment in CLIL
https://www.slideshare.net/mirun/clil-5-assessment-in-clil
This presentation by teacher Joan Oro considers general issues with assessment and then focusses on particular issues with assessing in the context of CLIL.

Conference Paper: Assessment and Evaluation in CLIL
https://conference.pixel-online.net/conferences/ICT4LL2011/common/download/Paper_pdf/CLIL03-193-FP-Maggi-ICT4LL2011.pdf
This paper describes the EU-financed project "Evaluation and Assessment in CLIL" which implements the CLIL principle of using a second language to communicate, listen to and learn from others. It notes the lack of established assessment practices for combined assessment of content and language.

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Assessment of Learning

Assessment **of** learning – summative assessment where teachers use evidence of student learning to make judgements on student achievements against goals and standards.

Assessment of learning typically comprises end-of-learning assessment tasks such as examinations and tests, to measure and record the level of learning achieved, for progression to the next level or for certification. While it may appear that it has been eclipsed by Assessment For/As Learning, the approaches are complementary, and the teacher should decide on the timing and balance between them.

The difficulty for CLIL is in merging the assessments – more typically the subject content may be assessed and not the language, or vice versa.

Some of the tools recommended for Assessment for Learning may also be utilised on a local basis for summative assessment. For example, group projects being researched and compiled into reports/portfolios and presentations may constitute a final summative assessment with appropriate rubrics.

Assessment of Learning

The C4C – CLIL for Children Erasmus+ project guidelines for teachers includes some useful ideas on assessment, using the 'What, How, Why, When' methodology as shown in Table 2.

What?	Characteristics	How?	Why?	When?
Assessment **Of** Learning	Mainly summative: assesses knowledge acquisition and level of competence. Qualitative or Quantitative grading	Through teacher report or final mark attributed to student according to national legislation (percentages may vary for content and for language). Tests and exams	To check if learning objectives were met.	At the end of a module, or several modules, or a course.

Table 2: Summary of Assessment Of Learning

Source: http://www.clil4children.eu/wp-content/uploads/2018/06/Guide_Addressed_to_Teachers_Vol01.pdf

Online Resources for Assessment of Learning

Conference Paper: Assessment and Evaluation in CLIL
https://conference.pixel-online.net/conferences/ICT4LL2011/common/download/Paper_pdf/CLIL03-193-FP-Maggi-ICT4LL2011.pdf
This paper describes the EU-financed project "Evaluation and Assessment in CLIL" which implements the CLIL principle of using a second language to communicate, listen to and learn from others. It notes the lack of established assessment practices for combined assessment of content and language.
Teacher Guidelines: C4C Erasmus+ Project Chapter 8
http://www.clil4children.eu/wp-content/uploads/2018/06/Guide_Addressed_to_Teachers_Vol01.pdf
This chapter includes several ideas and rubrics for assessment. For example, it looks at sample of formative assessment of the 4C's for a specific learning activity.

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Assessment For/As Learning

Assessment is at the heart of effective teaching, like a bridge between teaching and learning that enables teachers to measure how much of what they have taught has been learned. (William, D.)

Assessment ***for*** learning (AfL) is a type of formative assessment in which teachers use inferences about student progress to inform their teaching. Assessment ***as*** learning is another type of formative assessment in which students reflect on and monitor their progress to inform their future learning.

Formative assessment is complex, as its intention is to be directly diagnostic with the intention of immediate impact on the learner's next steps. In addition, it is formative for the teacher because it can alter planning and practice mid-unit or even mid-lesson for the teacher, changing tactics in response to the learning rather than waiting until the unit is finished as with summative assessment. (Coyle et al. 2010) They state that apart from students' and teachers' reflection on the teaching and learning process, AfL requires assessment tools suited to the CLIL context, which measure language, content, and skills "for a real purpose in a real context", that is tools which mirror real-life activities through contextualized, authentic and alternative means of measuring students' progress. CLIL assessment tools need to reflect a balance between language and cognitive demand.

Examples of effective assessment tools described by Otto include:

- **Portfolios:** can include samples of student work in different media and may be paper-based or electronic formats. One benefit of the electronic format is that it can include audio or video files that may underpin the language learning.
- **Journals:** can have different forms but will promote reflective practice and self-assessment in students.
- **Performance-based assessment**: can be in different formats that develop students' skills beyond memorisation, e.g., as oral presentations, interviews, narratives and descriptions, blog entries, model making, (collaborative) projects, web quests, and concept maps.
- **Self and peer assessment:** only effective if the teacher has trained the students before application and explained the marking criteria.
- **Checklists**: Used by teachers in informal class observation, they can be helpful to notice and assess students' progress, in the form of can-do descriptors, which can be easily linked with assessable learning outcomes. (LOMCE, 2013)
- **Rubrics:** may be holistic or analytic rubrics and can be useful descriptors to make the assessment process as transparent as possible for students who may also utilise the criteria used by teachers in assessing work so that they can work on them in their daily practice.

Otto gives further examples including 'WALT - We Are Learning To' and 'WILF – What I am Looking For ' posters as shown in Figure 2. These can focus the teacher planning (WALT) and the student self-assessment (WILF). Some educators recommend a third poster to deepen reflective practice on learning intentions – 'TIB – This Is Because'.

In the CLIL4STEAM videos and some of the teaching resources, the KWL methodology provides a focus that could be used for formative assessment and self-assessment.

- **K:** What do we **know**?
- **W:** What do we **want** to learn?
- **L:** What have we **learned**?

It is possible to generate simple subject, class specific KWL charts as shown in Figure 3.

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Figure 2: WALT, WILF and TIB templates
Source: https://www.twinkl.ie/resource/t-c-908-walt-wilf-tib-standing-tabletop-target

Name: _____ Subject: Carbon Cycle
Teacher Name: Marie Date: _____

Photosynthesis

K What I know	W What I want to Learn	L What I have Learned

Figure 3: sample KWL Chart
Source: Generated using Teachnology https://www.teach-nology.com/cgi-bin/kwl.cgi

The way the teacher asks questions is also an important skill and feedback is a vital element of AfL. It provides information about how the learner is doing in their efforts to reach a goal, giving comments and suggestions rather than grades. Feedback could also come from the learner to the teacher about how they feel the teacher could help them learn better. There are many ways that students can be encouraged to engage in deeper reinforcement and assessment of the learning that have the dual function of giving feedback to the teacher, for example: Exit notes, Thumbs Up/Side/Down, Think/Pair/Share, Reflective Journal, Question/Answer, 3/2/1 Strategy, etc.

Online Resources for Assessment For/As Learning
Rubric: Bloom's Technology in Practice https://pdst.ie/pp/literacynumeracy/aflresources

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

The handout on implementation of Bloom's Technology by Professional Development Service for Teachers (PDST) in Ireland gives useful explanations of how to develop questioning. This is also applicable to Assessment for Learning.

Poster: Assessment Reform Group. (2012). **Assessment for Learning: Ten Principles.** Retrieved from http://www.hkeaa.edu.hk/DocLibrary/SBA/HKDSE/Eng_DVD/doc/Afl_principles.pdf
This poster guides teachers through ten principles of AfL and encourages them to implement it in their classroom practices.

Article: Assessment Issues in CLIL: What You've Been Wondering but Were Afraid to Ask
https://app.rdim.es/archivos/publicacion/303dce018b15282742f1b7545667f026.pdf
This article by Ana Otto considers general issues with assessment and then makes suggestions for effective formative assessment techniques in CLIL.

Interactive Web Portal: Getting Started with Assessment for Learning
https://www.cambridge-community.org.uk/professional-development/gswafl/index.html
This web portal by the Cambridge International Education Teaching and Learning Team gives clear definitions, examples and underpinning theory for teachers who have not fully implemented Assessment for Learning. It includes interactive elements.

References (for the whole area)

C4C - CLIL for Children Erasmus+ STRATEGIC PARTNERSHIPS (KEY ACTION 2) Project number: 2015-1-IT02-KA201-015017 http://www.clil4children.eu/wp-content/uploads/2018/06/Guide_Addressed_to_Teachers_Vol01.pdf [Accessed 02/04/2021]
Coyle. D., Hood, P. & Marsh. D. (2010). "CLIL: Content and Language Integrated Learning". Cambridge, UK: Cambridge University Press.
Kiely, R. "CLIL – The question of assessment" Developingteachers.com is a useful introduction to CLIL philosophies and the nature of potential assessments.
https://www.unifg.it/sites/default/files/allegatiparagrafo/20-01-2014/kiely_r._clil_assessment.pdf [Accessed 02/04/2021]
Massler U., Stotz, D., and Queisser, C. (2014). Assessment instruments for primary CLIL: the conceptualisation and evaluation of test tasks. The Language Learning Journal 42/2:
137-150
Otto, Ana; Estrada, José Luis. "Towards an Understanding of CLIL Assessment Practices in a European Context: Main Assessment Tools and the Role of Language in Content Subjects". CLIL. Journal of Innovation and Research in Plurilingual and Pluricultural Education, [online], 2019, Vol. 2, Num. 1, pp. 31-42,
https://www.raco.cat/index.php/clil/article/view/359606 [Accessed 27/04/2021]
Reierstam, H, (2015). Assessing Language or Content? A comparative study of the assessment practices in three Swedish upper secondary CLIL schools. (Licentiate thesis in Subject Matter Education at the Department of Education and Special Education). Gothenburg, Sweden: Faculty of Education, University of Gothenburg. Retrieved from https://gupea.ub.gu.se/bitstream/2077/40701/4/gupea_2077_40701_4.pdf [Accessed 02/04/2021]
University, State Kazakhstan, Student, Phd. Buketov, Ye & Kitibayeva, Alfiya. (2021). Assessment issues in content and language integrated learning (CLIL).
https://www.researchgate.net/publication/348482476_Assessment_issues_in_content_and_language_integrated_learning_CLIL [Accessed 01/05/2021]
Williams, D. Edited transcript of a talk given at the Cambridge Assessment Network Conference on 15 September 2006 at the Faculty of Education, University of Cambridge.
https://dylanwiliam.org/Dylan_Wiliams_website/Papers_files/Cambridge%20AfL%20keynote.doc [Accessed 18/06/2021]

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Digital Tools for Assessment

Digital tools for assessment are plentiful and continuously evolving. Packages like **Google Forms** and **MS Forms** can be adapted to produce quizzes. We have already mentioned **Flipgrid** and **Mentimeter** and some of the resources on the CLIL4STEAM web portal utilised **Wordwall** and **EdPuzzle**.

The links to on-line resources listed below give information about different tools – most of which are freely available. One of the advantages of many of the digital assessment tools is that they provide instant feedback. Another is that they can be used in class or at home. Some of the popular tools are described in the table below.

Tool	Web link	Description
Kahoot	https://kahoot.com/	**Kahoot** allows teachers and students to create, share and play fun learning games or trivia quizzes in minutes. Teachers create a FREE account and can select from Kahoots already created or create their own set of Kahoot multiple-choice questions. Players answer the questions on their own devices, while games are displayed on a shared screen to unite the lesson.
Gimkit	https://www.gimkit.com/	**Gimkit** is a game show for the classroom that requires knowledge, collaboration, and strategy to win. Students answer questions on their own devices at their own pace. Throughout a Kit, each student will get exposure to the questions multiple times to ensure mastery.
Quizlet	https://quizlet.com/	**Quizlet** gives different options for learning and reviewing vocabulary. They are Learn, Test, Scatter, and SpaceRace. Students can compete against each other or learn on their own.
Quizalize	https://www.quizalize.com/	**Quizalize** allows teachers to create a FREE account and can choose from pre-made quizzes or create their own. The standards-aligned quizzes can be played as fun, competitive games in class or set as homework assignments. The students have the questions and answers on their screens while Kahoot only has the answers to choose from.
Padlet	https://padlet.com/	**Padlet** is a free online tool that is best described as an online notice board. Padlet can be used by students and teachers to post notes on a common page and is recommended for collaborative projects. The notes posted by teachers and students can contain links, videos, images and document files.
Seesaw	https://web.seesaw.me/	**Seesaw** is a digital portfolio and communication tool that many teachers recommend. Seesaw works on any device shared or 1:1. Free for teachers. Teachers create activities for students. Students draw, take pictures and video, and capture their learning in their portfolio.
Edpuzzle	https://edpuzzle.com/	**Edpuzzle** allows you to turn videos into a quick assessment.

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

		Choose a video on YouTube, Khan Academy, Crash Course, or upload your own. Trim the video, insert a quiz anywhere and track your students' progress.
Wordwall	https://wordwall.net/	You can use a limited number of templates for free, and because Wordwall is web-based, with a good connection you can create activities quickly and easily in a matter of minutes. Once you have created an activity, it is shareable in different ways, e.g., digital and print.

Table 3: Digital assessment tools

Online Resources for Assessment For/As Learning

Assessment for Learning: Why use digital tools to assess? https://www.remc.org/professionallearning/learn-at-your-own-pace/assessment-tools-for-the-classroom/why-use-digital-tools-to-assess/

75 digital tools and apps teachers can use to support formative assessment in the classroom https://www.nwea.org/blog/2019/75-digital-tools-apps-teachers-use-to-support-classroom-formative-assessment/

There are formative assessment apps for everything from discussion to quizzing, polling, and student responses to interactive lessons and videos. https://www.commonsense.org/education/top-picks/top-tech-tools-for-formative-assessment

Formative assessment is such an essential part of the learning process and student success, and many digital tools can help support this process. https://shakeuplearning.com/blog/20-formative-assessment-tools-for-your-classroom/

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

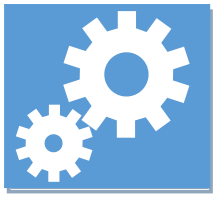
Appendix – Guidelines for Application

EXAMPLE – Some IT packages and Apps to consider

Generating Ideas

Packages and Apps	
Mentimeter	www.mentimeter.com
MS Teams Whiteboard	
WordCloud Generator	www.freewordcloudgenerator.com
Microsoft Educator Community	https://go.microsoft.com/fwlink/?linkid=849031
Mindmap	www.**mind**meister.com
	www.wisemapping.com

Combining Ideas



Packages and Apps	
Microsoft One Note	www.onenote.com
Evernote	www.evernote.com
Google Docs	www.google.com/docs/about/
Mindmap	www.mindmeister.com
	www.wisemapping.com

Opinions/Survey

Packages and Apps	
Mentimeter	www.mentimeter.com
Survey Monkey	www.surveymonkey.com
Google Forms	www.google.com/docs/about/

Presentation

Packages and Apps	
MS Powerpoint	
MS Teams Wiki	
Microsoft Office Sway	Microsoft Sway - My Sways (office.com)
Google Slides	www.google.com/docs/about/
Flipgrid	www.flipgrid.com
Canva	www.canva.com

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Project Number: 2019-1-PL01- KA201-065027

EXAMPLE – Worked Example – Renewable Energies

This can be a useful task to conduct at the beginning and end of a topic to get students engaged and as a recap. These can be used at both a class level and at an individual level.

Beginning

What I Know and **What I Want to Learn** are guides at the beginning and can help to develop the focus of the learning. The **What I have Learned** will normally be empty.

End

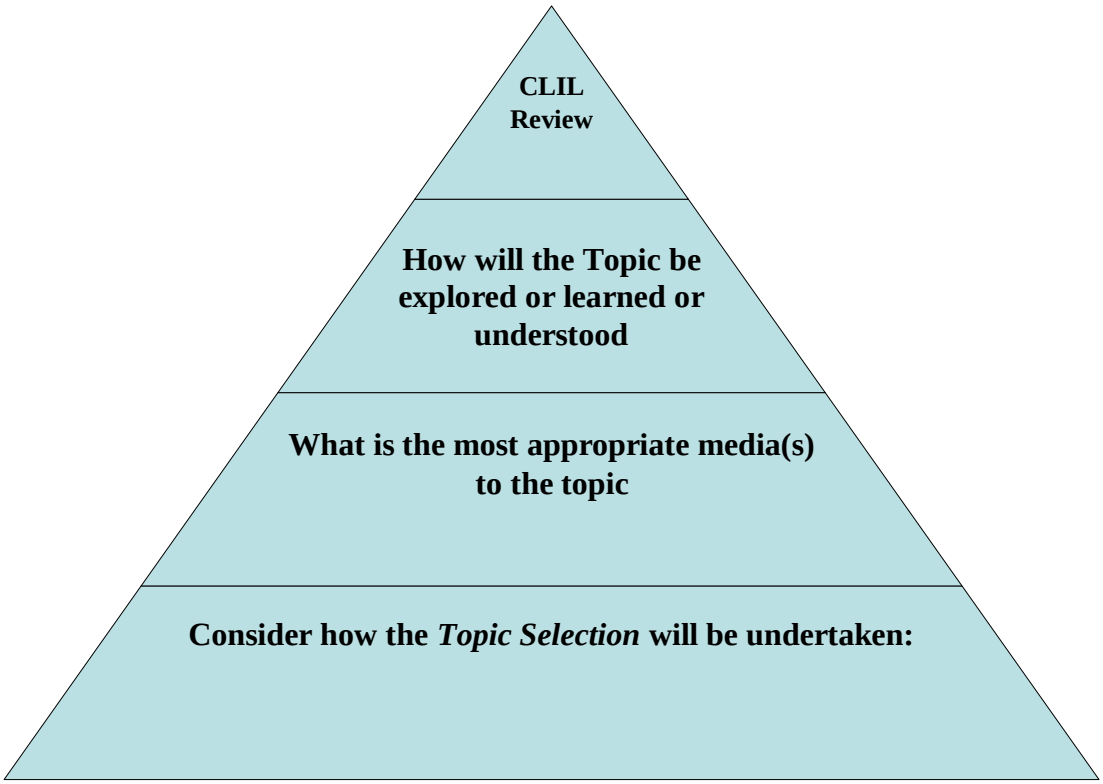
What I Know will have expanded and **What I Want to Learn** should have reduced or the issues become more detailed and complex. This may present a platform of topics to move further into a topic area or to incorporate related topics.
The **What I have Learned** should be far more developed and can act as a summary or close out of the topic.

K	W	L
What I *Know*	**What I *Want* to Learn**	**What I Have *Learned***

	Characteristics
What?	Mainly summative or formative: Assesses knowledge acquisition and level of competence. Qualitative or Quantitative grading
How?	Through teacher report or final mark attributed to student according to national legislation (percentages may vary for content and for language). Tests and exams
Why?	To check if learning objectives were met.
When?	At the end of a module, or several modules, or a course.

Co-funded by the Erasmus+ Programme of the European Union

The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.



CLIL Stages	Considerations	Outcome
CLIL Review	What worked – How can that be improved What failed – How can that be addressed	Building on the aspects and technologies that worked and expanding them into other weaker areas
Task-Design	**Introduction Stage:** • Wordcloud or Menti app of what the students think of in relation to that topic • Overview video or documentary • Incidence or occurrence of a relevant outcome to the topic (flooding links to Greenhouse effects; solar panels links to Renewable Energies) **Core Stage:** • Group or individual exploration of the topic • Class projects to explore aspects of the topic	**Introduction Stage:** • List of prompt words available to promote discussion • Source an overview video from CLIL resources or elsewhere • Prepare a list of examples or relevant occurrences of **Renewable Energies** **Core Stage:** • Consider how best to have students involved: individual work, select own groups, assigned to

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

	• Presentations/demonstrations back to the class on aspects of the topic	groups, mix up groups for each stage • Format of class project – paper, electronic, mixed options • Format of class Presentations or demonstrations back to the class – recorded/live etc
Choice of Media	Combination of Media types can be considered: • What are the facilities available in the class or to individual students? • What is the student's IT ability to engage with the media options? **<u>Introduction Stage:</u>** • Wordcloud or Menti app • Overview video • Documentary **<u>Core Stage:</u>** • Electronic presentations – TicTok, Flipgrid, Zoom etc. • Electronic demonstrations • Existing electronic resources	Strong broadband in school and IT facilities in classroom Students only going to be required to work individual and in groups in school over a period of 3 weeks **<u>Introduction Stage:</u>** • Menti app – wordcloud option for student input in what they associate with Renewable Energies • Review CLIL video 17 on Renewable Energies • From Wordcloud select 4 areas for students to research on **Renewable Energies** **<u>Core Stage:</u>** • Students give in class presentations on their researched areas • Student's source 1 additional existing electronic resource in their area
Topic Selection	• A predetermined list by the teacher • Student selection from a range of options – encouraging discussion and debate on topics and order of the topics to be worked through • Game orentiated of bingo or lottery of the topics that each student has. Generating student investment in "their" topic	• Student selection from a range of options using Menti or similar app to make selections • Example for selection **Renewable Energies**

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Project Number: 2019-1-PL01- KA201-065027

Practical Activities and Learning Objects

Let's build a model house in 3D

Teacher	Country	School
Marcin Paśnikowski	Poland	Szkoła Podstawowa nr 5 im. Janusza Kusocińskiego w Świdniku

Students' Age	Subject	Topic	Students' target level of competence (CEFR)	Language Skills
12-14	• Technology • Arts	Technical drawing and 3D modelling	A2	• Listening • Speaking • Reading

Learning objectives (related to curriculum content)

The objectives of the learning scenario are:

- Understanding the concepts of scale and 3D modelling
- Developing technical drawing skills
- Understanding the impact climates have on the building of structures and materials

Learning outcomes

Students will be able to: This field is dedicated to describe how the students is able to apply the learning objectives
After applying this scenario students will be able to design a model house in a particular climate zone as well as creating it in scale using recycled materials.

Cognitive skills

- Analyzing various climate zones and the effect climate has on the building of structures
- Hypothesizing on the best building materials for a particular climate zone
- Listing building materials and explaining their usage

Language Function

Students will be able to:

- Talk about various climate zones and building materials
- Watch and listen to the video about designing and 3d modelling
- Reading and understanding a simple text

Key language

Vocabulary:

- Building materials: wood, adobe, straw, stone, brick, glass
- Climate: arctic, tropical, taiga, moderate, oceanic
- Types of structures: house, hut, igloo, skyscraper, cottage

Verb:

- Build, model, scale, use, draw, choose, transform

Co-funded by the Erasmus+ Programme of the European Union

The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Language structure:

- The passive: is used, can be found
- Comparatives: better, bigger, more expensive

Activities

1) Students brainstorm various types of houses, building materials and climate zones
2) They work in groups and they choose one climate zone and decide which type of house and material would be the best one
3) Students watch the videos (Model House Part 1 & 2) to learn how to design, scale and build a 3D model of their chosen structure
4) Students draw their model in 3D
5) Students choose some recycled materials and create the model in a proper scale
6) Each group evaluates the other groups' work

Assessment FOR learning

Students evaluate the other teams' success in these areas: quality of design and construction and the performance of the design against climate tests.

Assessment OF learning

Vocabulary and grammar quiz at the end of the project

Material, resources, web tools

Video Lessons

- https://youtu.be/wSpK9eRbXKo
- https://youtu.be/sb9jp2GSCW8

Created Teaching Resources

- https://clil4steam.pixel-online.org/data/tr_creation/11.docx

Other Resources

- https://www.getepic.com/app/read/65197

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

CLIL for STEAM
Project Number: 2019-1-PL01- KA201-065027

A ride with gravity

Teacher	Country	School
Mihaela Vatavu Ioan Juncu Pasa Marius	Romania	EuroEd Secondary School

Students' Age	Subject	Topic	Students' target level of competence (CEFR)	Language Skills
15-16	• Math • Physics • Technology	Force of gravity	B1 B2	• Listening • Speaking • Reading • Writing • Interaction

Learning objectives (related to curriculum content)

The aim of this learning scenario is to use knowledge of the laws of motion, velocity, and acceleration to understand how roller coasters function, to experiment with virtual roller coasters and to design and build a roller coaster.

Learning outcomes

Students will be able to:

- Review the forces of gravity and friction
- Explain how a roller coaster works in terms of physics concepts
- Identify and explain the features of their roller coaster and describe how it works
- Explain how Newton's second law affects a roller coaster
- Identify points in a roller coaster track at which a car has maximum kinetic energy and maximum potential energy
- Design and build a roller coaster that fits within the given specifications

Cognitive skills

- Listing roller coaster features
- Matching key words to their definition
- Identifying the principles that make roller coaster function
- Describing the forces behind a roller coaster
- Extracting the main ideas from a text
- Experimenting the functioning of a roller coaster on an interactive tool
- Designing a roller coaster in class
- Concluding and presenting the results of the experiment

Language Function

- Clarifying what it has been said
- Comparing and contrasting
- Analyzing
- Applying
- Classifying

Key language

Vocabulary:

- Gravity, potential energy, kinetic energy, friction, Law of Conservation of Energy, acceleration, velocity, inertia, centripetal force, thrill elements, loop, acceleration, deceleration, g-force

Verb:

Co-funded by the Erasmus+ Programme of the European Union

- To accelerate, to decelerate, to pull, to push

Language structure:

- Present simple
- Passive voice in present

Activities

Lesson 1 – Forces that make a roller coaster move - 1h

The teacher presents the students a picture of a roller coaster and asks them the following questions: *How many of you have ever ridden on a roller coaster? Why do people enjoy or hate riding on roller coasters? What makes them fun or scary?*

The teacher then asks the students to share some of their experiences with roller coasters and points out some of the unique features of them, such as loops and hills. Then the teacher asks the students to do a true/false quiz about roller coasters: https://wordwall.net/resource/17847850/rollercoasters. The teacher tells students that roller coasters are powered by gravity, and therefore he/she asks the students to watch the video https://youtu.be/9blaY6W41dg about the force of gravity and do the digital exercise https://clil4steam.pixel-online.org/teaching-resources-sch.php?id_asch=63&section_asch=creation, which will enable students to review the keywords from the video lesson and reinforce the terminology.

The students are given a list of the main terms related to forces and movement and their definitions and asks the students to work in pairs and match up the term to the definition. The task can also be done in a digital form: https://wordwall.net/resource/17840205/types-forces. In this way the students will reinforce their previous knowledge related to forces that make objects move, so that they can understand the principles that make roller coasters function.
In the end of the lesson, the teacher divides the students in four groups and gives them the assignment to read a different section from the site https://science.howstuffworks.com/engineering/structural/roller-coaster.htm, as follows: Group 1 – Section 4 (Roller coasters Physics), Group 2 – Section 5 (Roller Coasters Forces), Group 3 – Section 6 (Roller Coaster and your body) and Group 4 – Section 7 (Loop-the-Loop). The students will have to extract the main ideas from each section and to present them in the next class. The teacher offers the students a visual aid to help them with the assignment: https://www.youtube.com/watch?v=rLiW168r2oI - The physics of the roller coaster.

Lesson 2 – A ride in a roller coaster 1h

Before starting the presentation of the main ideas of the reading sections, the teacher asks the students to work in pairs and do the quizlet: https://quizlet.com/74160546/rollercoasters-flash-cards/ which reinforces the main key terms discussed in the previous lesson. Then the students present the assignment and the teacher gives further explanations on the topic.

In order to make students more interested in how roller coasters are designed, the teacher presents them The Roller Coaster Model Interactive https://www.physicsclassroom.com/Physics-Interactives/Circular-and-Satellite-Motion/Roller-Coaster-Model, which provides an interactive playground for exploring the physics of roller coasters. Three different pre-set sections of track can be investigated or learners can design their own layout by dragging hotspots on the track to desired locations in order to shape the track the way they wish. Force and velocity vectors can be toggled on and off. Friction can be turned on and off as well. Energy bar charts are displayed as the coaster car moves along the track. The simulation animates the motion of a coaster car along the track designs and displays energy bar charts as the car moves along the track. The teacher divides the students into four groups, each group designing a roller coaster and testing it. Then each group will have to write a short description of their work and present it to the class.

Lesson 3 – Building my roller coaster 1h

The teacher reviews the background information with all the students and divides them into three groups. The students in each group will have to work together to design and construct a roller coaster. Each group will be given the following materials: foam pipe insulation cut in half, glass marbles (for a roller coaster full of people), wooden marbles (for empty cars), plastic cups, masking tape, a stopwatch and a ruler. Before starting to work, the students watch the video https://youtu.be/rOifCcAdNgY which gives them all the necessary explanations. The teacher gives each group of students the rules: Group 1 – two loops and no hills, Group2 – One loop and one hill, Group 3 – at least one hill and no loops.

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

The height of each roller coaster must not exceed 1 m, and the length of the foam pipe insulation must be 50 cm. Learners will be successful if they: identify which roller coaster will cause the marbles to travel the fastest, and explain how each roller coaster affects the marble speed.
After the experiment has finished, the teacher asks the students to discuss the results by answering the following questions: *What did you learn from your testing model? / Which model was the most creative? / Which was the safest? / What improvements would you make and why? Where does each coaster have the highest potential energy? And kinetic energy?/ How is friction affecting our trial runs?*

Assessment FOR learning

- Teacher's informal classroom observation of learners as they perform pair and group work
- Students' participation in all tasks and activities
- Students' interaction with a partner (speaking creatively)
- Students' ability to understand and apply instructions

Assessment OF learning

- Assessment of an authentic product

Material, resources, web tools

Video Lessons

- https://youtu.be/9blaY6W41dg

Created Teaching Resources

- https://clil4steam.pixel-online.org/teaching-resources-sch.php?id_asch=63&section_asch=creation

Reviewed Teaching Resources

- https://clil4steam.pixel-online.org/tr_reviewed-sch.php?id_asch=37&section_asch=review

Other Resources

- https://www.bbc.co.uk/bitesize/topics/z72vrj6/articles/zm4cqp3 - What goes up must come down
- https://www.explainthatstuff.com/rollercoasters.html#forces - Rollercoasters (Article)
- https://wordwall.net/resource/17840205/rollercoasters
- https://wordwall.net/resource/17847850/rollercoasters
- https://quizlet.com/74160546/rollercoasters-flash-cards/
- https://www.physicsclassroom.com/Physics-Interactives/Circular-and-Satellite-Motion/Roller-Coaster-Model
- https://youtu.be/rOifCcAdNgY
- https://wordwall.net/resource/17840205/types-forces
- https://science.howstuffworks.com/engineering/structural/roller-coaster.htm
- https://www.youtube.com/watch?v=rLiW168r2oI

Materials:

- Foam pipe insulation cut in half
- Glass marbles (for a roller coaster full of people)
- Wooden marbles (for empty cars)
- Plastic cups
- Masking tape
- A stopwatch
- Ruler

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

CLIL for STEAM
Project Number: 2019-1-PL01- KA201-065027

Aliphatic hydrocarbons

Teacher	Country	School
Vatavu Mihaela Irina Farcas	Romania	EuroEd Secondary School, Vasile Alecsandri High School

Students' Age	Subject	Topic	Students' target level of competence (CEFR)	Language Skills
16-17	• Chemistry	Hydrocarbons	B2	• Listening • Speaking • Reading • Writing • Interaction

Learning objectives (related to curriculum content)

The aim of this learning scenario is to introduce students to organic chemistry and the structure of hydrocarbons, to explain the importance of aliphatic hydrocarbons and their derivatives, their properties, and to make a storyboard about experimenting addition and substitution reactions.

Learning outcomes

Students will be able to:

- Define aliphatic hydrocarbons
- Identify the different types of structures and bonds of aliphatic hydrocarbons
- Differentiate between saturated and unsaturated and between nonpolar and polar aliphatic hydrocarbons
- Explain the flammable properties of aliphatic hydrocarbons
- Explain saturated or unsaturated
- Describe the aliphatic hydrocarbons derivatives
- Make a storyboard or a film about a chemical reaction

Cognitive skills

- Identifying organic and inorganic compounds
- Recalling basic chemistry of carbon
- Classifying hydrocarbons
- Comparing aliphatic families according to different criteria
- Matching key words to their definitions
- Carrying out a project
- Presenting a project

Language Function

- Identifying
- Clarifying what has been said
- Instructing
- Creating
- Comparing and contrasting

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Key language

Vocabulary:

Organic chemistry, carbon, element, compound, unique, valence, electron, covalent bonds, molecule, methane, hydrocarbons, aliphatic, aromatic, chains, rings, benzene, homologous series, family, functional group, alkane, alkene, alkyne, classification, saturated, unsaturated, ethane, ethyne, combustible, carbon dioxide, stable, substitution, reactive, addition, polymerisation

Verb:

- To bond, to react

Language structure:

- Present simple
- Passive voice in Present

Activities

Lesson 1 – Aliphatic hydrocarbons – 1h

The teacher writes the formula of methane and the formula of sodium chloride on the board and asks the students which of the two compounds is organic and which is inorganic. After eliciting the answers (methane is organic because it contains carbon), the teacher circles the methane formula (CH4) and points out that this organic compound has only two types of atoms – carbon and hydrogen. Then the teacher writes HYDRO and CARBON on the board, stating that all compounds that contain only atoms of carbon and atoms of hydrogen are called hydrocarbons. After that the teacher presents the topic of the lesson: Hydrocarbons and their derivatives.

The teacher reviews the students' knowledge related to the basic chemistry of carbon by giving them a handout containing the following questions: *How many electrons does a carbon atom have?/ Of those six electrons, how many are valence electrons?/ How many more electrons does carbon need to complete its valence shell?/ How many bonds can it make with other atoms?/ How many electrons does hydrogen have?/ How many more electrons does hydrogen need to complete its valence shell?/How many bonds does hydrogen make with other atoms?* The teacher asks the students to write down the answers on the handout and to check them while watching the video https://youtu.be/s-oYAn8j7YY - Hydrocarbons - alkanes, alkenes and alkynes, up to minute 1:35.

The teacher divides the students into three main groups and gives each group a handout with a frame in which they will have to make notes about the three aliphatic families: alkanes, alkenes and alkynes. Each group is assigned to one of these families. The information contained in the frame relates to similarities and differences (names, types, characteristics). The teacher starts the video again up to minute 4:32 and presses stop from time to time to allow the students to make notes. After watching the video the students present their findings, using comparatives to describe the differences and the similarities in the three hydrocarbon families.

As home assignment, the students do the interactive exercise https://wordwall.net/resource/50353/hydrocarbons-match-up which will reinforce their knowledge

Lesson 2 – Aliphatic hydrocarbons and their properties – 1 h

The teacher starts the lesson by asking the students to complete a KWL chart about aliphatic hydrocarbons. The chart enables both teacher and students reflect on how well the students retained the knowledge and how motivated they are to learn more.

Then the teacher shows the students three models for the molecules of ethane, ethane and ethyne and asks the students describe the types of bond between the two atoms of carbon in each of the three situations (single, double and triple). Then the teacher explains to the students that they are going to understand the connection between the bonds and the hydrocarbons properties. The teacher pairs up the students and asks them to watch the video https://youtu.be/s-oYAn8j7YY - Hydrocarbons - alkanes, alkenes and alkynes from minute 4:33. The teacher stops the video from time to time to ask the

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

students the video quiz questions and collect the answers. While watching the video, the students in each pair will have to make notes on saturated and unsaturated hydrocarbons (stable or reactive, type of reactions they undergo). Then the students communicate in pairs to share their findings and to describe a substitution reaction and an addition reaction, respectively!
The teacher groups the students in four groups, ABCD. Groups A and C will do the activity https://clil4steam.pixel-online.org/teaching-resources-sch.php?id_asch=80&section_asch=creation and groups B and D will do https://clil4steam.pixel-online.org/teaching-resources-sch.php?id_asch=81&section_asch=creation. The students only take the photos during the activities and will make the films at home, as assignment.

Lesson 3 – Aliphatic hydrocarbons and their derivatives – 1 h

The students present their projects in class.

For a better retaining of the knowledge, the teacher shows the students the video https://www.youtube.com/watch?v=CEH3O6l1pbw and after watching it, they should do the quiz https://wordwall.net/resource/19280092 .

The teacher shows the students the formula of methane and methanol and asks the students what those two compounds have in common and what they have different. After eliciting the answers the teacher explains the students that methanol is a derivative of methane because it has another chemical element (oxygen) besides the atoms of carbon and hydrogen. The students watch the video https://youtu.be/hlXc_eEtBHA - Hydrocarbon Derivatives and do the following quiz: https://wordwall.net/resource/19280352.

As home assignment, the students will have to do more research on hydrocarbons derivatives and make notes on their formula and uses.

Assessment FOR learning

- Teacher monitors individual, pair and group activities.
- Students participate in all tasks and activities.
- Students work autonomously to carry out a practical activity and to do research.
- Students successfully play matching exercises.
- Students do self and peer assessment.

Assessment OF learning

Storyboards and films on addition and substitution reactions.

Material, resources, web tools

Video Lessons

- https://youtu.be/s-oYAn8j7YY

Created Teaching Resources

- https://clil4steam.pixel-online.org/teaching-resources-sch.php?id_asch=80&section_asch=creation
- https://clil4steam.pixel-online.org/teaching-resources-sch.php?id_asch=81&section_asch=creation

Reviewed Teaching Resources

- https://wordwall.net/resource/50353/hydrocarbons-match-up
- https://clil4steam.pixel-online.org/teaching-resources-sch.php?id_asch=150&section_asch=review

Other Resources

- https://www.youtube.com/watch?v=CEH3O6l1pbw
- https://wordwall.net/resource/19280092

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

- https://youtu.be/hlXc_eEtBHA - Hydrocarbon Derivatives
- https://wordwall.net/resource/19280352

Materials

- Molecular models and modelling clay (playdough or plasticine)
- Coloured paper
- Marker pens
- Your mobile phone camera
- Movie Maker app or Screencastomatic (or similar)

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

CLIL for STEAM
Project Number: 2019-1-PL01- KA201-065027

Bending the light

Teacher	Country	School
Vlad Orza Cristina Farzi Cipriana Cioclea	Romania	EuroEd Secondary School, Paunescu School for children with special needs

Students' Age	Subject	Topic	Students' target level of competence (CEFR)	Language Skills
16-18	• Physics • Technology	Reflection and Refraction	B1 B2	• Listening • Speaking • Reading • Writing • Interaction

Learning objectives (related to curriculum content)

The aim of this learning scenario is to enable students to understand and to acknowledge the physics laws that regulate the phenomenon of refraction and to reproduce it with simple experiments.

Learning outcomes

Students will be able to:

- Define refraction
- Define angle of refraction, angle of incidence and refractive index
- Recognize that light travels at different speeds in different media
- Recognize that the greater the refractive index of a substance, the slower light travels in the substance
- Recognize that light which incidents non normally on a media boundary changes propagation direction
- Describe why and how light bends when it speeds up or slows down as it enters a second medium
- Explain the relationship between angles of incidence and angles of refraction
- Conduct an experiment to prove the laws of refraction

Cognitive skills

- Labelling a picture of refraction
- Describing the refraction phenomenon
- Sequencing the stages of an experiment
- Matching key words to their definitions
- Writing short paragraphs
- Analysing a phenomenon
- Justifying a choice
- Conducting an experiment and proving a theory
- Presenting a project

Language Function

- Comparing and contrasting
- Identifying and classifying
- Clarifying what has been said
- Instructing
- Analysing and evaluating

Key language

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Vocabulary:

- Light, straight lines, refraction, angle, image, transparent, refractive index, bending, lens, incident ray, refractive ray, normal

Verb:

- To bend, to refract

Language structure:

- Passive voice in present
- Adjectives and comparatives

Activities

Lesson 1 – Refraction: bending of light – 1 h

Teacher starts the lesson by showing the students a picture with 'the broken pencil' https://ingeniumcanada.org/sites/default/files/styles/large_1/public/2019-01/gallery_pencil_2.jpg?itok=Rw_nUzUy, and then introduces the topic of the lesson: Refraction – Bending of light. Then the teacher asks students to come up with some ideas on the reason why the pencil looks bent. In order to review some basics of refraction, the students watch the video https://youtu.be/zHi6i-QAYj0 - Reflection and refraction from min. 3:28 to min 4:20. While watching, they will have to make notes so that they can answer the following questions: *What is refraction? When do light bend? What is a refractive index?* After watching the video and collecting the students' answers, the teacher gives students a handout containing a picture representing refraction and asks students to label it (*angle of refraction, angle of incidence, normal, light ray).*

The teacher shows the students the picture of 'the broken pencil' and tells the students that they are going to watch a video that will explain the phenomenon: https://www.youtube.com/watch?v=SeaWCamCHWQ - Refraction of Light - Why does a pencil look bent in water? While watching the video, the students are provided with a graphic organizer containing true/false statements, questions and ordering statements).
In the end of the lesson, the students work in pairs and write a short paragraph containing the explanation of what they have just watched. If necessary, they will watch the video again.

As home assignment the students have to watch two videos https://www.britannica.com/video/151064/Explanation-refraction and https://www.britannica.com/video/151364/Demonstration-refraction, and use the information to make a glossary with the specific terms.

Lesson 2 – Refraction and tricks of light -1 h

The teacher starts the lesson by showing the students two pictures representing refraction of light: in the first the light goes from a medium with higher density to one with lower density and in the second the other way around. Then the teacher asks the students to analyse the pictures and to state which medium is denser than the other, based on the angles of refraction and the angles of incidence. Then the teacher tells the students what an optical medium is and asks the students to give some examples.
The teacher divides the students in groups of four and presents them an experiment they will have to carry out: https://clil4steam.pixel-online.org/teaching-resources-sch.php?id_asch=61&section_asch=creation. The students are given only the directions on how to perform the experiment and not the explanation behind it. After finishing the experiment, the students in each group work collaboratively to write a paragraph in which they explain what happened, based on all the knowledge presented to them so far.

Assessment FOR learning

- Teacher monitors group and individual activities.
- Students participate in all tasks and activities.
- Students work autonomously to conduct an experiment.
- Students match words with definitions.
- Students interact with peers and work collaboratively to perform a task.
- Students do self and peer assessment

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Assessment OF learning

- Paragraphs with explanations of experiments

Material, resources, web tools

Video Lessons

- https://youtu.be/zHi6i-QAYj0

Created Teaching Resources

- https://clil4steam.pixel-online.org/teaching-resources-sch.php?id_asch=61&section_asch=creation

Reviewed Teaching Resources

- https://clil4steam.pixel-online.org/teaching-resources-sch.php?id_asch=203&section_asch=review

Other Resources

- https://ingeniumcanada.org/sites/default/files/styles/large_1/public/2019-01/gallery_pencil_2.jpg?itok=Rw_nUzUy
- https://www.britannica.com/video/151064/Explanation-refraction
- https://www.britannica.com/video/151364/Demonstration-refraction

Materials:

- Paper
- Glasses
- Pencils and markers
- Water

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Project Number: 2019-1-PL01- KA201-065027

Carbon dioxide – friend or enemy?

Teacher	Country	School
Vatavu Mihaela Carmen Brinzila	Romania	EuroEd Secondary school

Students' Age	Subject	Topic	Students' target level of competence (CEFR)	Language Skills
14-15	• Chemistry • Biology	The biogeochemical cycle of carbon	B1	• Listening • Speaking • Reading • Writing • Interaction

Learning objectives (related to curriculum content)

This learning scenario aims to understand the role of carbon and its circuit in nature, and the positive and negative impact of carbon dioxide in our lives.

Learning outcomes

Students will be able to:

- Describe the global carbon cycle and its components
- Explain the flow among the components in the carbon cycle
- Discuss the role of the carbon cycle in climate
- Analyse and discuss the impact of human activities (such as the use of fossil fuels) on CO_2 levels in the carbon cycle
- Define carbon dioxide
- Name and explain several uses for carbon dioxide
- Predict the possible effects of excess carbon in the system on the earth's climate
- Identify how humans influence the carbon cycle

Cognitive skills

- Listing items that contain carbon
- Labelling different stages of the carbon cycle
- Putting different stages of carbon cycle in order
- Describing the most important features of carbon dioxide
- Explaining a chemical process
- Analysing positive and negative impact of carbon dioxide and justifying the choice

Language Function

- Agreeing and disagreeing
- Asking questions
- Comparing and contrasting
- Evaluating
- Analysing

Key language

Vocabulary:

Biogeochemical cycle, carbon, biological, geological, chemical, carbon dioxide, organic, compounds, proteins, carbohydrates, lipids, abiotic, biosphere, biotic, ecosystem, Photosynthesis, energy source, producers, consumers, respiration, solar energy, interdependent, climate change, global warming

Co-funded by the Erasmus+ Programme of the European Union

The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Verb:

- To produce, to heat, to breathe, to eliminate, to burn

Language structure:

- Passive Voice in the present
- Adjectives and comparatives
- Present simple

Activities

Lesson 1 -The carbon in our world and its cycle– 1 h

The teacher starts the lesson by writing the symbol of carbon on the board and then telling the students that carbon is a common element on earth. Then the teacher has the students recall some of the items in their lives that contain carbon. The students write the words on the board. Then the teacher explains to the students that the carbon contained in the items they mentioned does not stay there forever, but move from one thing to another in a cycle, called the carbon cycle. The teacher presents the students the video: https://youtu.be/MwcQ8rX80aM - The Biogeochemical Cycle of Carbon, up to minute 3:00. While watching the video, the students have to fill in a gapped text about the different forms carbon can be found in the real world.
Then the teacher writes the symbol of carbon dioxide on the board and elicits the name. The students have to answer the questions: *What is carbon dioxide? Where does carbon dioxide come from? Do you produce carbon dioxide?* After eliciting the answers, the teacher gives the students cards containing different stages of the carbon cycle, and, while watching the rest of the video https://youtu.be/MwcQ8rX80aM - The Biogeochemical Cycle of Carbon, from min. 3:00, asks them to put the cards in order, so that they can obtain the carbon cycle. For a better understanding of the phenomenon, the students do the interactive exercise: https://wordwall.net/resource/3192830/biogeochemical-cycle-of-carbonclil4steam

As home assignment, the students have to watch https://www.youtube.com/watch?v=VTbxS9evlkQ - What Is Carbon Dioxide? and answer the following questions: *What is carbon dioxide? What type of chemical bonds are between the atoms of oxygen and carbon? What are the processes that use carbon dioxide? What are its main uses? What is its main negative effect?*

Lesson 2 – Carbon dioxide: the good and the bad sides – 1 h

The teacher starts the lesson by asking the students what they understood from the video they had to watch at home. The students read the answers of the assignment. Then the teacher asks them if carbon dioxide is good or bad for our lives. After eliciting the answers, the teacher asks the student to read the text
https://sciencing.com/list-5921485-effects-carbon-dioxide-air-pollution.html and afterwards to do the interactive gapped test: https://wordwall.net/resource/19280689/carbon-dioxide-air-pollution . Then the teacher pairs up the students and invites them to assume the positive role of the carbon dioxide and the negative one. Each pair has a role (positive or negative). All the students are given handouts with the following text: https://granthaminstitute.com/2015/10/19/carbon-dioxide-the-good-and-the-bad-the-right-and-the-wrong/. The students must read the text attentively, work in pairs and write at least three elaborated sentences in which they state the positive or the negative role carbon dioxide has in our world. The teacher offers all the support necessary.
In the end of the lesson, the students take turns in presenting their statements to their classmates.

Assessment FOR learning

- Teacher monitors individual, pair and group activities.
- Students participate in all tasks and activities.
- Students work autonomously to carry out a practical activity and to do research.
- Students successfully play matching exercises.
- Students do self and peer assessment.

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Project Number: 2019-1-PL01- KA201-065027

Assessment OF learning

Statements with positive and negative impact of carbon dioxide

Material, resources, web tools

Video Lessons

- https://youtu.be/MwcQ8rX80aM

Created Teaching Resources

- https://clil4steam.pixel-online.org/teaching-resources-sch.php?id_asch=10&section_asch=creation

Reviewed Teaching Resources

- https://clil4steam.pixel-online.org/teaching-resources-sch.php?id_asch=17&section_asch=review

Other Resources

- https://www.youtube.com/watch?v=VTbxS9evlkQ - What Is Carbon Dioxide?
- https://sciencing.com/list-5921485-effects-carbon-dioxide-air-pollution.html
- https://wordwall.net/resource/19280689/carbon-dioxide-air-pollution
  https://granthaminstitute.com/2015/10/19/carbon-dioxide-the-good-and-the-bad-the-right-and-the-wrong/

Materials

- Multimedia: visual, auditory, digital
- Charts
- Handouts
- Worksheets

Co-funded by the Erasmus+ Programme of the European Union

The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Project Number: 2019-1-PL01- KA201-065027

Carbon, carbon everywhere

Teacher	Country	School
Marcin Paśnikowski	Poland	Szkoła Podstawowa nr 5 im. Janusza Kusocińskiego w Świdniku

Students' Age	Subject	Topic	Students' target level of competence (CEFR)	Language Skills
13-15	• Biology • Chemistry	The Carbon Cycle	B1	• Listening • Speaking • Reading • Writing • Interaction

Learning objectives (related to curriculum content)

The objectives of the learning scenario are:

- understanding the concepts of carbon cycle
- noticing the importance of carbon-based products in our life
- understanding the positive and negative impact of carbon-based products

Learning outcomes

Students will be able to: This field is dedicated to describe how the students is able to apply the learning objectives
After applying this scenario students will be able to analyse the positive and negative impact of carbon on the environment and will be able to discuss the ways to prevent the negative ones.

Cognitive skills

- Naming various examples of carbon-based products
- Analyzing the positive and negative aspects of the carbon cycle
- Hypothesizing on the ways to diminish the negative aspects of the carbon cycle
- Listing building materials and explaining their usage
- Evaluating the pros and cons of carbon

Language Function

Students will be able to:

- name carbon-based products they encounter in everyday life
- watch and listen to the video about the carbon cycle
- reading and understanding a simple text

Key language

Vocabulary:

- Atom, carbon bond, carbon dioxide, climate, element, fossil fuel, mineral, organic, oxygen, photosynthesis, sediment

Verb:

Co-funded by the Erasmus+ Programme of the European Union

The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

- Decay, burn, cut down

Language structure:

- The Present Continuous to express a gradual development of a process
- The Present Perfect to describe recent changes
- The Future Simple to express predictions about the future
- The Zero Conditional to describe laws of nature

Activities

7) Students brainstorm various types of everyday objects which are made of carbon
8) Students read the eBook entitled "The Carbon Cycle" to find out if they were correct
9) Students watch the video (The Carbon Cycle) to learn about the importance of carbon in nature and its influence on the environment. They take down notes in English.
10) Students divide into groups and prepare a court trial of carbon trying to present its positive and negative influence. They need to prepare valid arguments together with examples and justifications. They need to assign the role of the judge, attorneys, prosecutors, witnesses and the defendant
11) Peer- and self-assessment - students evaluate their performance - the ability to present and justify their arguments

Assessment FOR learning

Students evaluate their own knowledge by filling in a chart "Now I can". They also assess each others' performance during the trial.

Now I can	😃😃😃	😃😃	😃	😟	😟😟
understand the concepts of carbon cycle					
notice the importance of carbon-based products in our life					
understand the positive and negative impact of carbon-based products					
name carbon-based products they encounter in everyday life					
understand the contents of the video about the carbon cycle in English					
read and understand a simple text about the carbon cycle					

Assessment OF learning

Teacher marks the students' performance during the trial.

Material, resources, web tools

Video Lessons

- https://www.youtube.com/watch?v=MwcQ8rX80aM

Other Resources

- https://www.getepic.com/app/read/65093

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Project Number: 2019-1-PL01- KA201-065027

Clean water for everyone!

Teacher	Country	School
Elza Gheorghiu Mihaela Vatavu Carmen Brinzila Cristian Timofticiuc	Romania	EuroEd Secondary School

Students' Age	Subject	Topic	Students' target level of competence (CEFR)	Language Skills
14-15	• Physics • Biology • Chemistry	Our Plastic World	B1	• Listening • Speaking • Reading • Writing • Interaction

Learning objectives (related to curriculum content)

The aim of this learning scenario is to understand how water cycles in nature, what the most important sources of water are, how pollution affects the water and what we can do to preserve the water clean.

Learning outcomes

Students will be able to:

- Define and describe the water cycle
- Explain the role of water for humans and plants
- Apply and demonstrate knowledge and understanding in activities
- Explain how water cycles through evaporation, condensation and precipitation
- Analyse the results of a filtering wastewater experiment
- Learn how to make clean water with natural materials

Cognitive skills

- Labelling a water cycle diagram
- Listing key terms related to water cycle
- Making predictions about a phenomenon
- Describing the causes and the effects of the water pollution
- Researching the connections between key concepts in various resources
- Carrying out experiments to understand a phenomenon
- Analysing and interpreting the results of an experiment

Language Function

- Clarifying what has been said
- Comparing and contrasting
- Analysing
- Predicting
- Asking questions
- Instructing

Key language

Co-funded by the Erasmus+ Programme of the European Union

The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Vocabulary:

- Sea, river, lake, rain, hail, snow, ice, water, cloud, ocean, sun, droplet, mountains, valley, plants, surface, underground, vegetation, soil, condensed water, steam, watershed, earth

Verb:

- To evaporate, to condense, to freeze, to melt, to change, to form, to heat, to drop, to cool, to fall, to snow, to rain, to hail, to need, to flush, to boil, to filter, to save, to produce, to sediment, to filter, to separate

Language structure:

- Adverbs and adjectives
- Passive voice
- Sequencing structures

Activities

Lesson 1 – Water cycle – 1 h

The teacher starts the lesson by asking the students the following questions: *Why is Earth often called the 'blue planet?' How much of our bodies are composed of water? Can you think of a day in without water? Is it possible for water to disappear from the Earth? Why or why not?*

The teacher pairs up the students and engage them in collaborative discussions (teacher-led).

The teacher tells the students that they will learn about the water cycle. For understanding what this phenomenon means, the teacher presents the students the video https://www.youtube.com/watch?v=MfCLqCGqe6E about the water cycle. The video contains an embedded quiz, so the teacher pauses it from time to time to allow students answer the questions or to make predictions. To check students' understanding, they will do the following interactive exercises: https://wordwall.net/resource/415044/science/water-cycle, in which they will have to label a diagram representing the water cycle. The students then are divided in groups of four and given a handout with a text and a diagram https://www.freedrinkingwater.com/resource-water-cycle-student-guide.htm and https://www.weather.gov/media/jetstream/downloads/hydro2010.pdf. The students read the text and then, working collaboratively, will find definitions for the specific terms (water cycle, evaporation, condensation etc.) and write them down in a glossary.

As home assignment, the students will have to watch three videos: https://youtu.be/MwcQ8rX80aM - The Biogeochemical Cycle of Carbon, https://youtu.be/ Fq7HTY2r7M - The Greenhouse Effect and https://youtu.be/XIgl8r9z5WQ – Photosynthesis and extract all the information related to water, its pollution and its threats.

Lesson 2 –Water cycle and pollution – 1 h

The teacher starts the lesson by asking questions to students related to the link between water cycle and photosynthesis, the Greenhouse effect and the biogeochemical cycle of carbon, to check how they did their research.

Then the teacher pours water in a glass and asks the students: *How do we know we can drink this water? How polluted do you think water on Earth is? And since water is recycled, how can we purify it?* The students are paired up and discuss one-on-one (teacher-led). Then the students are invited to watch the video https://www.youtube.com/watch?v=Om42Lppkd9w – Water pollution, water contamination. While still paired up, the students take notes about the causes, the effects and the ways to stop water pollution. They will then have to fill in the gaps in a text about water pollution.

The teacher tells the students that they are going to see a video in which they are shown how nature works to make clean water: https://youtu.be/7fqEuKXanBg - How Nature Makes Clean Water.

In this respect, the teacher writes the following words on the board: *run-off and watershed* and gives explanations that will help students better understand what they are going to watch. Then, the teacher divides the students into groups of four and ask the students to take notes so that they could answer the following questions: *How does a watershed work — and why are these natural filters critical for clean drinking water? Why are watersheds beneficial for people and nature?*

In the end of the lesson, the students share their findings with their peers.

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Lesson 3 – Physical separation method of wastewater -1 h
The teacher starts the lesson by telling the students that they are going to conduct two experiments that will allow them to learn more about water pollution, water treatment and ways to fight against water pollution.

For the first experiment, the teacher presents a scale model of industrial water filtration so that students can understand what happens in a water treatment plant. The students, divided in groups of four, use Erlenmeyer flasks, filter paper, stirring rods, glass funnels and dirty water to simulate the real-life process. The students, guided and monitored by the teacher, decant and filter the water until they obtain filtered water. The students use their observation sheets to write the amount of sediments and filtrate resulted after the experiment. Then they have to state their conclusions about the amount of sediments in the wastewater.

For the second experiment, the students have to imagine that they are in the woods, with no drinking water, and they have to improvise a water filtration device. The teacher presents the students the theory behind the filtering process and the required materials: used plastic bottles, small amounts of coal, sand and gravel, and cotton disks. The water they have to filter is dirty. The students have to let the water to sediment and in the meanwhile they prepare the filtering device: the filter consists of a plastic bottle, with the bottom removed, inside which the following layers are placed: large stones, small gravel, sand, coal, covered with a layer of cotton wool or cotton layers. The water obtained in this way is analysed in terms of characteristics: colour, smell, taste, turbidity. Then the students share their observation with their peers. The observation sheet is presented here: https://wordwall.net/resource/19342675/water-filtration-observation-sheet

In the end, the students work in groups and write short paragraphs in which they propose solutions to fight water pollution.

The experiment protocol can be found here: https://wordwall.net/resource/19342322/water-filtration-experiment-protocol

The video made by EuroEd School for this learning scenario: https://www.youtube.com/watch?v=MTAFaebdPJI&authuser=0

Assessment FOR learning

- Teacher monitors individual, pair and group activities
- Students participate in all tasks and activities
- Students work autonomously to do research or to conduct experiments
- Students interact successfully with partners
- Students do self and peer assessment

Assessment OF learning

- A glossary
- Completed experiments and observation sheets filled in

Material, resources, web tools

Video Lessons

- https://youtu.be/MwcQ8rX80aM - The Biogeochemical Cycle of Carbon
- https://youtu.be/_Fq7HTY2r7M - The Greenhouse Effect
- https://youtu.be/XIgl8r9z5WQ - Photosynthesis

Other Resources

- https://www.youtube.com/watch?v=MfCLqCGqe6E – water cycle
- https://wordwall.net/resource/415044/science/water-cycle
- https://www.freedrinkingwater.com/resource-water-cycle-student-guide.htm
- https://www.weather.gov/media/jetstream/downloads/hydro2010.pdf
- https://www.youtube.com/watch?v=Om42Lppkd9w – Water pollution, water contamination
- https://youtu.be/7fqEuKXanBg - How Nature Makes Clean Water.
- https://www.youtube.com/watch?v=MTAFaebdPJI&authuser=0
- https://wordwall.net/resource/19342322/water-filtration-experiment-protocol
- https://wordwall.net/resource/19342675/water-filtration-observation-sheet

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Materials:

- Erlenmeyer flasks
- Filter paper
- Stirring rods
- Glass funnels
- Dirty water
- used plastic bottles
- small amounts of coal sand and gravel
- cotton disks

Co-funded by the Erasmus+ Programme of the European Union

The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

CLIL for STEAM
Project Number: 2019-1-PL01- KA201-065027

Every day stem cells save lives

Teacher	Country	School
Elza Gheorghiu Adela Serea	Romania	EuroEd Secondary school, Paunescu Secondary school

Students' Age	Subject	Topic	Students' target level of competence (CEFR)	Language Skills
16-17	• Biology	Stem Cells	B2	• Listening • Speaking • Reading • Writing • Interaction

Learning objectives (related to curriculum content)

The aim of this learning scenario is to learn about stem cells, their potency to form other types of cells, which enables them to have therapeutic uses, and the ethics of using them.

Learning outcomes

Students will be able to:

- Define stem cells
- Identify types of stem cells
- Understand the differences between various types of stem cells
- Recognise why stem cell research is important
- Understand the use of stem cells and why scientists are so interested in them
- Understand the advantages and disadvantages associated with stem cell use, and the current limitations
- Sustain a point of view related to the ethics of using embryonic stem cells

Cognitive skills

- Classifying the types of stem cells
- Giving definitions
- Matching words to their definitions
- Predicting what the ethics behind the use of stem cells is
- Finding out and extracting information from a text
- Comparing embryonic and adult stem cells
- Justifying the reasons of the ethical and unethical use of stem cells

Language Function

- Asking questions
- Comparing and contrasting
- Classifying
- Analysing and evaluating
- Reasoning

Key language

Vocabulary:

- Stem cell, disease, building block, embryo, organ, tissue, pluripotent, paralysis, Alzheimer, cancer, regenerative medicine, cell-based therapy, replacement, macular degeneration, spinal cord, stroke, diabetes, arthritis, multipotent, regenerating, replacing, undifferentiated, differentiated, hematopoietic, bone marrow, pelvis, femur,

Co-funded by the Erasmus+ Programme of the European Union

sternum, umbilical cord, peripheral, red blood cells, white blood cells, platelets, daughter cells, transplant, lymphoma, anaemia, chemotherapy, sickle cell

Verb:

- Divide, renew, replace, replicate

Language structure:

- Present simple
- Conditionals
- Passive voice in present
- Wh-Questions

Activities

Lesson 1 – Stem cells and their importance – 1 h

The teacher starts the lesson by showing them a picture of a cell and tells the students that our lives started with only one cell. Then the teacher announces the topic of the lesson, stating that the students will learn more about cells and, most importantly, about the amazing stem cells. The teacher elicits what stem cells are and tells the students that they are going to find more about them by watching the video https://youtu.be/aRACHGP7Yho, up to minute 2: 28. While watching the basics about the stem cells, the students have to take notes so that they can answer the following questions: What are stem cells? What are their abilities? What does pluripotent mean? Then the teacher draws a concept map on the board, with missing information about the kinds of stem cells, their origin and their type, gives the students handouts with the same concept map and asks the students to watch the rest of the video and fill in the missing information. For a better understanding and retaining of the new vocabulary and knowledge, the students do the interactive exercise https://wordwall.net/resource/9625428/stem-cell-quiz.

The teacher checks the students' understanding of the importance of stem cells by asking them the following questions: *What are pluripotent stem cells? What are multipotent stem stems? From where are embryonic stem cells removed? What could embryonic stem cells possibly treat? Which types of stem cells are present in the bone marrow of children?*
Which conditions and diseases are treated with adult stem cells?
The students give answers and the teacher summarizes them and then writes the answers on the board. The students copy the answers in their notebooks.

As home assignment, the students have to read the article https://www.yourgenome.org/facts/what-is-a-stem-cell and make a glossary with the specific terms.

Lesson 2 – Stem cells therapies and ethics-1 h

The teacher checks the assignment.
Then the teacher shows the students pictures of different body organs and elicits answers from the students about the use of stem cells in treating different diseases. Then the teacher divides the class into even number of groups and assigns half of the groups to the embryonic stem cells and the other half to the adult stem cells. The students from both groups read the article https://www.medicalnewstoday.com/articles/323343#donating-and-harvesting and then work collaboratively to search for information and discuss it so that they can fill a table with the following rubrics: *Definition/ Properties/Uses*, each group for the type of stem cell assigned to them. After finishing the task, the students exchange the tables between groups and do peer assessment.
The teacher shows the students the picture of Dolly, the first cloned animal and asks the students what their opinion about cloning is. Then the teacher explains that there are a lot of debates regarding the ethics of using embryonic stem cells. Students are separated into 6 groups to go over a point of view that is presented to them. Each group is given 3 point of view cards (with real cases that can be from https://cells4life.com/cord-blood-banking-overview/stem-cell-case-studies/) and a policy worksheet. The teacher explains to the students that they are going to watch a video, https://www.youtube.com/watch?v=Dr72oeRIOJE - Ethics of Therapeutic Stem Cell Uses and instructs the students to complete Part A of the worksheet with their group and facilitates discussions among groups. Students read and complete Part B of the policy worksheet and participate in teacher-led discussion. In the end, all groups establish their views on policies and opinions and share with the class. An example of the policy worksheet is given here: https://wordwall.net/resource/19341934/embryonic-stem-cells-worksheet

Assessment FOR learning

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

- Teacher monitors group, pair and individual activities
- Students participate in all tasks and activities
- Students interact with partners (speaking creatively)
- Students autonomously do research and use the information to construct ideas and justifications
- Students can match specific terms to their definitions

Assessment OF learning

- Policy worksheet completed

Material, resources, web tools

Video Lessons

- https://youtu.be/aRACHGP7Yho

Reviewed Teaching Resources

- https://wordwall.net/resource/9625428/stem-cell-quiz
- https://clil4steam.pixel-online.org/teaching-resources-sch.php?id_asch=109&section_asch=review

Other Resources

- https://www.yourgenome.org/facts/what-is-a-stem-cell
- https://biologydictionary.net/embryonic-stem-cell/
- https://www.medicalnewstoday.com/articles/323343#donating-and-harvesting
- https://www.youtube.com/watch?v=Dr72oeRIOJE - Ethics of Therapeutic Stem Cell Uses
- https://cells4life.com/cord-blood-banking-overview/stem-cell-case-studies/
- https://wordwall.net/resource/19341934/embryonic-stem-cells-worksheet

Materials:

- Posters
- Handouts
- Debate cards

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Project Number: 2019-1-PL01- KA201-065027

Exponential Growth (1)

Teacher	Country	School
Aneta Seremak, Agata Ziętek	Poland	Szkoła Podstawowa nr 5 im. Janusza Kusocińskiego w Świdniku

Students' Age	Subject	Topic	Students' target level of competence (CEFR)	Language Skills
13-14	• Math	Exponential Growth	B1 B2	• Listening • Speaking • Reading • Writing • Interaction

Learning objectives (related to curriculum content)

Upon completion of this lesson, students should be able to:

- Explain what Exponential Growth is
- Apply a model to concrete examples
- Know key vocabulary in English

Learning outcomes

Students will be able to use Exponential Growth to solve real world examples and mathematical problems. They will know how to do deduction of the mathematical model.

Students will acquire the basic English vocabulary related to Exponential Growth.

Cognitive skills

Students will understand and be able to apply Exponential Growth calculations. They will be able to define what Exponential Growth is, understand the concept of Exponential Growth, apply a model to concrete examples. They will improve their sustained, selective, divided attention, long term memory, logic, and reasoning.

Language Function

- Students will be able to explain what Exponential Growth is.
- Students will learn to describe, analyze, summarize and draw conclusions.

Key language

Vocabulary:

- Amount, growth, current value, proportion, equation, formula.

Verb:

- Work out, determine, form, solve, define, occur, double, grow.

Language structure:

- Present simple tense, modal verbs, future simple.

Activities

12) Introducing the topic and the key vocabulary.

Co-funded by the Erasmus+ Programme of the European Union

The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

13) Demonstrating the video lesson, when the teacher wants to ask questions and give explanation to the content the video is paused.
14) Students are provided some time to work individually with the glossary to improve their reading skills and practice new vocabulary.
15) Teacher gives learners words or phrases which are associated with the glossary term and requires them to create mind maps of words in themes.
16) Teacher makes sure that students understand the content by giving them problems selected from Web site. The teacher presents the web site and does pauses in certain moments to give students opportunity to make notes, asks questions and develops some presented problems. The teacher should give them a feedback and show students more examples on the blackboard. Students should do the presented exercises and answer the questions in pairs.
17) Demonstration of Anagrams and working in groups of three, finding the solutions in the fastest time.
18) Students do the dictionary with new words presented during the lesson.
19) The teacher asks students to reflect on what they have learned and summarizes the lesson.
20) As homework teacher can ask students to do Exponential Growth Crossword.

Assessment FOR learning

At the end of the classes the teacher questions the students, observes the students' work, the and provides the feedback and gives support.

Assessment OF learning

Students take a test.

Material, resources, web tools

Video Lessons

- https://clil4steam.pixel-online.org/video-library-sch.php?id_asch=21

Created Teaching Resources

- https://clil4steam.pixel-online.org/teaching-resources-sch.php?id_asch=14&section_asch=creation
- https://clil4steam.pixel-online.org/teaching-resources-sch.php?id_asch=99&section_asch=creation
- https://clil4steam.pixel-online.org/teaching-resources-sch.php?id_asch=54&section_asch=creation

Reviewed teaching Resources

- https://clil4steam.pixel-online.org/teaching-resources-sch.php?id_asch=95&section_asch=review

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

CLIL for STEAM
Project Number: 2019-1-PL01- KA201-065027

Exponential Growth (2)

Teacher	Country	School
Dovilė Žigienė	Lithuania	Trakų Vytauto Didžiojo gimnazija

Students' Age	Subject	Topic	Students' target level of competence (CEFR)	Language Skills
14-16	• Math	Exponential Growth	B1 B2	• Listening • Speaking • Reading • Writing • Interaction

Learning objectives (related to curriculum content)

Upon completion of this lesson, students will be able to:

- Explain what Exponential Growth is
- Know key vocabulary in English

Learning outcomes

Students will be able to:

- Students will be able to describe Exponential Growth with examples in savings and chess board
- Apply a model to concrete examples
- Calculate the numerical values of the functions and draw the graphs

Cognitive skills

Students will develop self-motivation, problem solving, self-directed and independent learning skills. They will improve their sustained, selective, divided attention, long term memory, logic, and reasoning.

Language Function

In this lesson, students will use the language to describe Exponential Growth

Key language

Vocabulary:

- Linear growth, exponential growth, a concise way, savings, chessboard, a constant proportion, current value, quantity, to the power of t, the rate of growth

Verb:

- Introduce, explain, depend, increase

Language structure:

- Present simple, future perfect; basic English vocabulary linking with mathematical and technical terms

Activities

21) Introducing the topic and topic-related vocabulary.
22) Demonstrating the video lesson.
23) The video is paused several times so that students have some time to think, ask questions, and participate in the discussion.
24) During the review of the video the students are encouraged to write down the words that they want to learn.

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

25) Working individually students calculate the numerical values of the function.
26) Working in pairs students compare and explain their solutions.
27) The teacher monitors the students' work and provides the necessary support when needed.
28) The teacher asks students to reflect on what they have learned in the lesson and summarizes the lesson.

Assessment FOR learning

The teacher will question the students and provide feedback in this way, helping the students to understand what the successful work looks like in each task (for example, calculating the functions.).

Assessment OF learning

Students will be assessed at the end of the unit by completing an equation solution test.

Material, resources, web tools

- **Video lesson**
- https://clil4steam.pixel-online.org/video-library-sch.php?id_asch=21
-
- **Created teaching resources**
- https://clil4steam.pixel-online.org/data/tr_creation/16.pdf
- https://clil4steam.pixel-online.org/tr_created-sch.php?id_asch=52&section_asch=creation
- https://clil4steam.pixel-online.org/data/tr_creation/54.pdf
- https://learningapps.org/watch?v=p8kqb2x4n21
- https://clil4steam.pixel-online.org/data/tr_creation/53.pdf
- https://learningapps.org/watch?v=p259pzwi321
-
- **Reviewed teaching resources**
- https://sites.google.com/a/hdsb.ca/grade-11-functions/home/grade-11-functions/unit-6---exponential-functions
- https://www.youtube.com/watch?v=x5OYmRyfXBY&app=desktop&ab_channel=GrowthBusters
- https://www.youtube.com/watch?v=Jzsz3e5Z4kg&ab_channel=Flippin%27ScienceVideos
- https://www.mathsisfun.com/algebra/exponential-growth.html
- https://www.mathsisfun.com/definitions/exponential-growth.html

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Project Number: 2019-1-PL01- KA201-065027

Force of gravity

Teacher	Country	School
Andrius Storta	Lithuania	Trakų Vytauto Didžiojo gimnazija

Students' Age	Subject	Topic	Students' target level of competence (CEFR)	Language Skills
14-16	• Physics	Force of gravity	B1	• Listening • Speaking • Reading • Writing • Interaction

Learning objectives (related to curriculum content)

The learning scenario is created to consistently provide the gravity force description: introduction video with main technical terms, homework reading, test and video to repeat the information, peer works in class to develop collaboration skills and to communicate the knowledge in English:

- To understand the fundamentals of the force of gravity and different elements of it.
- To learn thematic english words and use it them to describe the gravity in present simple tense.
- To explain the force of gravity (phenomenon, its causes and effects) to a peer friend in English terminology.
- To improve listening/speaking/interaction skills
- To provide solutions to problems in their context

Learning outcomes

Students will be able to: to explain the fundamentals of the force of gravity, gravity differences on the earth and on the moon, students will able to explain the difference between mass and weight.
Students will learn symbols and units in physics related to the gravity topic.

Cognitive skills

Attention, persception, memorising, analytical, critical thinking, communication, collaborative learning , self-directed learning and problem solving skills.

Language Function

- Comparing and contrasting: X is similar to.../ X differs from Y in that
- Giving definition using relatives: X is a ...which....
- Expressing opinions and asking for opinions: What do you think about.....?/ My opinion is that.....What's yours?
- Classifying: The two types of....are....

Key language

Vocabulary:

- Force, attraction, gravity, force of gravity, gravitational pull, force of attraction, mass, weight, object, earth, surface, moon, unit, amount, matter, interaction, space, effect, univers, star, planet, orbit, distance, direction, shape, Newtons

Verb:

- Attract, pull, push, move, determine, speed up, slow down, measure

Proposition:

- Towards

Adjectives:

Co-funded by the Erasmus+ Programme of the European Union

The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

- Large, small

Language structure:

- Present simple tense, conditional sentences construction, modals, reported speech, prepositions

Activities

Time required to complete the learning scenario is 4 hours

Phase 1: 1 hour home assignment
Flipped classroom approach: introduction – the teacher tells the students to watch a video about the force of gravity in English at home: https://clil4steam.pixel-online.org/video-library-sch.php?id_asch=9 and do a task (answer questions: What is a force?/Types of force/ What is gravity/mass/weight?/The effects of gravity). The students should prepare to describe the force of gravity to the class.
Exercise - an interactive cloze test on the basic lexical items related to gravity https://clil4steam.pixel-online.org/tr_created-sch.php?id_asch=34&section_asch=creation.
To repeat the knowledge students can use an eBook: https://clil4steam.pixel-online.org/tr_created-sch.php?id_asch=92&section_asch=creation

Phase 2: 2 hours (1 hour in class + 1 hour home assignment)
Students present the summary of the videos answering the questions of phase 1 to the class.
The teacher invites students to a brainstorming activity via mentimeter and writes any words they associate with the topic/ related nouns and verbs (weigh/weight, etc); the mother tongue version is also checked. The teacher checks the assignment and then checks comprehension by inviting students to do exercises:
Multiple choice questionnaires:
https://clil4steam.pixel-online.org/tr_created-sch.php?id_asch=63&section_asch=creation
The teacher tells students they are going to watch a video where a professor explains the law of gravity and performs an exciting experiment which demonstrates the consequence of the law on free falling objects: https://clil4steam.pixel-online.org/tr_reviewed-sch.php?id_asch=198&section_asch=review.
The teacher gives students a list of words (10/15) some of which are related to the topic and others are not. The teacher asks students to go through the list and underline the words they think are related to the video. The students watch the video (up to minute 2.57) and compare their predictions with their findings (checking understanding of the words/ mother tongue versions). The teacher sets students into pairs and asks them to find answers to questions related to the video (up to minute 2.57.):

- What is weight?
- What do scales display?
- Are mass and weight the same?

Focus on giving a definition. Then the teacher launches an intriguing question:

- If you drop a large apple and a small apple from a tall building, which one will hit the ground first?

Students negotiate an answer with their peers and then check their answer by watching the last section of the video.
Discussion: the teacher asks students to reflect on learning resource – speaking task (Think/Pair/Share).
https://clil4steam.pixel-online.org/tr_created-sch.php?id_asch=35&section_asch=creation
Focus on expressing opinions and asking for opinions.

Home assignment – students are asked to either create a poster on the topic and to perform multiple choice questionnaire to consolidate the knowledge:
https://clil4steam.pixel-online.org/tr_created-sch.php?id_asch=36&section_asch=creation
Assessment FOR learning
The teacher will question the students and provide feedback in this way, helping the students to understand what the successful work looks like in each task (for example, calculating the functions.).

Assessment OF learning

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Students will be assessed at the end of the unit.

Material, resources, web tools

Video lesson

- https://clil4steam.pixel-online.org/video-library-sch.php?id_asch=9

Created teaching resources

- https://clil4steam.pixel-online.org/tr_created-sch.php?id_asch=92&section_asch=creation
- https://clil4steam.pixel-online.org/tr_created-sch.php?id_asch=34&section_asch=creation
- https://clil4steam.pixel-online.org/tr_created-sch.php?id_asch=21&section_asch=creation
- https://clil4steam.pixel-online.org/tr_created-sch.php?id_asch=35&section_asch=creation
- https://clil4steam.pixel-online.org/tr_created-sch.php?id_asch=36&section_asch=creation
- https://clil4steam.pixel-online.org/tr_created-sch.php?id_asch=63&section_asch=creation

Reviewed teaching resources

- https://clil4steam.pixel-online.org/tr_reviewed-sch.php?id_asch=198&section_asch=review

Co-funded by the Erasmus+ Programme of the European Union

Project Number: 2019-1-PL01- KA201-065027

Global warming and climate change

Teacher	Country	School
Sigita Zalitienė	Lithuania	Trakų Vytauto Didžiojo gimnazija

Students' Age	Subject	Topic	Students' target level of competence (CEFR)	Language Skills
13-14	• Biology	The Greenhouse Effect	A2 B1	• Listening • Speaking • Reading • Writing • Interaction

Learning objectives (related to curriculum content)

The aim of this learning scenario is to:

- Introduce the process of global warming to students;
- Explain the way in which greenhouse gases trap heat in the earth's atmosphere;
- Raise students' awareness of problems caused by global warming;
- Encourage students to think about possible solutions to the problem discussed.

Learning outcomes

Students will be able to:

- Explain the phenomenon of global warming, its causes and effects;
- Describe the way in which greenhouse gases trap heat in the Earth's atmosphere, causing the Earth to warm up;
- Provide solutions to the problem of global warming;
- Explain the difference between weather and climate;
- Explain the phenomenon in English.

Cognitive skills

Students will develop note-taking, communication skills, self-motivation, critical thinking skills, and problem-solving skills.

Language Function

Students will use the language to explain the phenomenon, give opinion, pieces of advice, present and summafrize the ideas of the topic orally.

Key language

Vocabulary:

- Greenhouse, heat, carbon dioxide, gasses, surface, water vapor, methane, ozone, nitrous oxide, chlorofluorocarbons, weather, climate, long-term, short-term variation, average, temperature, humidity, precipitation, cloudiness, visibility, wind, storm, emissions, fossil fuels, coal, deforestation, reforestation, urbanization, desertification, sea levels, blanket, balance, drought, glacier, smog, crops.

Verb:

- Trap, absorb, release, include, contribute, produce, rise, react with, trigger

Language structure:

- Present simple, present perfect continuous

Co-funded by the Erasmus+ Programme of the European Union

The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Activities

1. Introducing the topic and topic-related vocabulary.
2. Before watching the video lesson, the copies with the questions about global warming are distributed to the students.
3. Demonstrating the video lesson.
4. The video lesson is paused when the teacher wants to ask questions and make sure that students understand the content.
5. Students work individually with the Word wall to improve their reading skills and practice new vocabulary.
6. Working in pairs, students exchange information they remember from the video lesson and compare their answers to the questions which they were given before watching the video.
7. Working in small groups, students discuss the problems caused by global warming. Students are encouraged to use the present perfect tense while talking about environmental problems.
8. The teacher asks students to answer the questions about global warming and encourages other students to comment on the answers.
9. Students are encouraged to share their ideas about solutions to the problem.
10. The teacher assigns the homework: to do an experiment (https://clil4steam.pixel-online.org/tr_created-sch.php?id_asch=60&section_asch=creation) and to write a report on the results of the investigation.
11. The teacher asks students to reflect on what they have learned in the lesson and summarizes the lesson.

Assessment FOR learning

The teacher will question the students and provide the feedback in this way, helping the students to understand what successful work looks like in each task (for example, answering the questions, using the present perfect tense correctly).

Assessment OF learning

Students will be assessed at the end of the unit. They will have to answer questions, solve problems, complete a presentation or write essays/reports according to the requirements of the national curriculum.

Material, resources, web tools

Video lesson

- https://clil4steam.pixel-online.org/video-library-sch.php?id_asch=12

Created teaching resources

- https://clil4steam.pixel-online.org/tr_created-sch.php?id_asch=71&section_asch=creation
- https://clil4steam.pixel-online.org/tr_created-sch.php?id_asch=75&section_asch=creation
- https://clil4steam.pixel-online.org/tr_created-sch.php?id_asch=95&section_asch=creation
- https://clil4steam.pixel-online.org/tr_created-sch.php?id_asch=60&section_asch=creation

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Project Number: 2019-1-PL01- KA201-065027

Grawitacja wokół nas

Teacher	Country	School
Agata Ziętek	Poland	Szkoła Podstawowa nr 5 w Świdniku

Students' Age	Subject	Topic	Students' target level of competence (CEFR)	Language Skills
13-15	• Physics	Gravity	A2 B1	• Słuchanie • Mówienie • Interakcja • Czytanie • Pisanie

Learning objectives (related to curriculum content)

Students will be able to:

- Describe the phenomenon of gravity and its consequences for life on Earth,
- Calculate the weight of the body depending on where it is located
- Describe the importance of this phenomenon in human life
- Try to observe this phenomenon around you

Learning outcomes

Students will be able to observe the discussed phenomenon, explain the conditions of its formation and the consequences of the influence of bodies on Earth

Cognitive skills

Students will develop self-motivation, problem-solving skills, independent learning and observation of phenomena in human life. They will improve their persistent, selective, divided attention as well as logic and reasoning

Language Function

Students will be able to explain the phenomenon of gravity and the interaction of bodies. Students will learn to hypothesize, describe, analyze, summarize and draw conclusions, and observe phenomena.

Key language

Vocabulary:

- Gravity, force, mass, weight, law, gravity, units, consequences

Verb:

- Solve, define, experiment, prove, apply, observe, define, calculate

Language structure:

- Present simple; basic English vocabulary with a combination of physical and technical terms

Activities

12. Introduction of the topic and vocabulary related to the topic.
13. Demonstration of a video lesson.

Co-funded by the Erasmus+ Programme of the European Union

The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

14. The film is paused several times so that students have time to reflect, ask questions, participate in discussions.
15. While watching the movie, students are encouraged to write down the words they want to learn.
16. Working in small groups, students compare their notes and explain the meaning of words and phenomena to each other.
17. Verifying concepts by reading the physical-professional text related to this phenomenon.
18. The teacher monitors the students' work, and if necessary, provides the necessary support.
19. Working with a professional text describing the phenomenon of gravity and answering the questions asked.
20. The teacher asks the students to reflect on what they have learned in the lesson and sums up the lesson.
21. Solving problems allowing to calculate the weight of various objects.
22. The teacher assigns homework to test their knowledge in a theory quiz.

Assessment FOR learning

The teacher will thus ask students questions and provide feedback, helping students understand what it is like to be successful in each assignment (e.g., hypothesizing from experience, solving theoretical problems).

Assessment OF learning

Students will be assessed at the end of the unit by passing a test.

Material, resources, web tools

Video Lessons

- https://www.youtube.com/watch?v=2PSjARmmL7M
- https://www.youtube.com/watch?v=6kOJhWA0Co0

Other Resources

- https://scienceprimer.com/mass-weight-gravity-qs
- https://ed.ted.com/lessons/how-far-would-you-have-to-go-to-escape-gravity-rene-laufer
- https://www.flipsnack.com/E88BA666AED/gravity-newton-s-law.html

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Project Number: 2019-1-PL01- KA201-065027

Habitats in danger!

Teacher	Country	School
Vatavu Mihaela Gabi Pascal	Romania	EuroEd Secondary school

Students' Age	Subject	Topic	Students' target level of competence (CEFR)	Language Skills
14-15	• Biology	Greenhouse Effect	B1	• Listening • Speaking • Reading • Writing • Interaction

Learning objectives (related to curriculum content)

The aim of this unit is to understand what habitats are and how to recognise to what extent and how the life cycles are affected by the environmental changes, to understand what the causes that endanger habitats are, to understand what endangered species are, to explore what causes some plants and animals to become extinct and to offer solutions to stop extinction.

Learning outcomes

Students will be able to:

- Define what 'habitat' is and give examples of different habitats
- Describe the main features of different habitats and describe how animals adapt to them
- Understand what the greenhouse effect is and explain it
- Identify the causes of the global warming
- Define 'extinction'
- List and explain the factors that lead to extinction
- Provide solutions to mitigate species extinction

Cognitive skills

- Recognising different habitats
- Identifying the adapting features of the animals
- Matching words with their definitions
- Finding out information about animals and habitats
- Giving examples of climate change
- Labelling diagrams
- Predicting the effects climate change has on habitats
- Identifying what 'endangered' and 'extinct' mean
- Hypothesising how they can fight against climate change
- Recommending ways to protect endangered species
- Creating a poster to raise awareness on the endangered animals

Language Function

- Describing
- Observing
- Classifying
- Predicting
- Reporting
- Generating hypothesis on causes & effects

Co-funded by the Erasmus+ Programme of the European Union

The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Key language

Vocabulary:

Habitat, rainforests, grasslands, the Arctic, desert, ocean, temperature, season, climate, deforestation, pollution, mining, urbanisation, prey, predator, droughts, landslides, hurricanes, endangered species

Verb:

- To deforest, to affect, to endanger, to threat, to conserve, to hunt, to pollute

Language structure:

- Conditionals
- Infinitive of purpose
- Passive Voice in present

Activities

Lesson 1 - What is its habitat? – 1 h

Teacher starts the lesson by asking the students to answer the following questions: *What would happen if one of you missed school today? What would happen if half the class missed school today? What if none of you came to school today?* The students will have to use 2nd Conditional to answer the questions. They will discover (with teacher's guidance, if necessary) that for the last two questions the answers will have negative connotation, and they will discuss the impact these three hypothetical situations might have on the school environment too (*e.g. If half the class missed school today it would be difficult for the teacher to perform in the usual conditions. If all of us missed class today, the lesson wouldn't be possible)*. The teacher writes the word "Habitat" on the board and asks the students to give some definitions for it. Then the teacher asks the students to watch the video https://www.youtube.com/watch?v=ZrSWYE37MJs (Habitats: What is a habitat?) and write down as many features the animals in the video have so they could adapt to their own habitat in order to survive. After collecting the answers from the students, the teacher asks them to check the correct answers by doing an interactive exercise: https://wordwall.net/resource/17907321/animals-habitats. The students are then asked to give other examples of habitats. After that, the teacher divides the students into four groups and assigns a habitat to each group. Next, the students will have to work collaboratively and choose a representative animal from that habitat, then write information on a worksheet under the following rubrics: *Name of the habitat, Representative animal, Habitat description, Special adaptation features of the animal to the habitat, Prey or predator.* The students will have to use the infinitive of purpose in order to explain how the animals adapted to their habitats (*e.g. has eight arms **to propel** itself in the water).* After finishing the task, the students will ask questions and will answer in turns, so that they can find information about the other groups' habitats and then complete the worksheets.

Lesson 2 – Endangered habitats and causes – 1 h

At the beginning of the lesson the teacher asks the students to recall the knowledge of the previous class by doing an interactive exercise https://quizlet.com/504881219/habitats-flash-cards/. Then the teacher shows the students several pictures with droughts, floods, landslides, hurricanes, melting glaciers and polluted cities, and asks students what they think the causes for the climate change are. The students will have to use Passive voice in present (*e.g. A landslide is caused by the land erosion).* After collecting the answers, the teacher presents the students a video about the Greenhouse Effect, https://youtu.be/_Fq7HTY2r7M, and the devastating impact this phenomenon has on the climate. Before watching the video, the teacher divides the class into groups, and within the groups into pairs and asks the students to solve the worksheet https://wordwall.net/print/9572438/greenhouse-effect-jumble, in order to check their understanding of the video. For a deeper understanding of this phenomenon which leads to dramatic climate changes and consequently to endangered habitats, the teacher points out that one of the main factors involved in the greenhouse effect is represented by the CO2, also called "the greenhouse gas". While watching https://youtu.be/MwcQ8rX80aM, the students, also organised in groups, will label the diagram https://wordwall.net/resource/3192830/biogeochemical-cycle-carbonclil4steam.

The teacher asks the students to work in pairs and think of the possible causes for habitat destruction. Then the teacher divides the students into four groups and gives them sections of a text with causes of habitat destruction: two sections with natural events (*fire, landslide, earthquake, volcano, tsunami)* and two sections with human caused events (*deforestation, pollution, mining, urbanisation*). The students have to read the texts and then work collaboratively within the groups to

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

identify and fill in the worksheets what the effects of those causes would have on the habitats. After completing the worksheets, the students will present the results in class.

Lesson 3 – Saving the endangered species 1 -1h
The teacher starts the lesson by asking the students to do an interactive exercise, https://wordwall.net/resource/9596802/greenhouse-effect-crossword. This crossword aims at reviewing the technical terms presented in the video lesson on Greenhouse Effect.
The teacher shows the students some pictures with extinct animals and with endangered animals and elicits what 'endangered' means. Then the teacher asks the students to watch the video https://www.youtube.com/watch?v=M1IDQSeJ1cs – Endangered Animals species and fill in an Endangered Species Graphic Organiser, which contains the following rubrics: *Animal/ What is its habitat?/ Why is it endangered?/ Other facts.*
Teacher asks students to identify five of the most important environmental issues that are affecting the Earth (teacher jots down the ideas on the board).

Then the teacher divides the students into five teams, each team selecting a different environmental problem. The students in each team have to use all the materials they have and Internet resources to make a poster which should represent the environmental problem, an endangered animal affected by it and a message that can raise people's awareness of the problem. The project is home assignment and the projects will have to be presented during the next class.

Lesson 4 – Saving the endangered species 2 -1 h
The teacher presents the core values which will be used to assess the students' projects: *title, coverage of the topic, graphic organisation, creativity, oral presentation.*

The students present their project posters.

The lesson ends with a discussion on the presentations.

Assessment FOR learning

- Teachers monitor group and individual activities
- Students communicate with others and to communicate their ideas
- Students participate in all activities
- Students complete the quizzes tasks successfully
- Students perform self-and peer assessment
- Students work collaboratively to solve a task

Assessment OF learning

Students design posters that meet all the core values

Material, resources, web tools

Video Lessons

- https://youtu.be/_Fq7HTY2r7M
- https://youtu.be/MwcQ8rX80aM

Created Teaching Resources

- https://clil4steam.pixel-online.org/tr_created-sch.php?id_asch=75&section_asch=creation

Reviewed Teaching Resources

- https://wordwall.net/resource/9572438/greenhouse-effect-jumble
- https://clil4steam.pixel-online.org/tr_reviewed-sch.php?id_asch=17&section_asch=review
- https://wordwall.net/resource/3192830/biogeochemical-cycle-carbonclil4steam

Other Resources

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

- https://www.youtube.com/watch?v=ZrSWYE37MJs
- https://wordwall.net/resource/17907321/animals-habitats
- https://quizlet.com/363549057/habitats-flash-cards/
- https://wordwall.net/resource/9596802/greenhouse-effect-crossword
- https://www.youtube.com/watch?v=M1IDQSeJ1cs

Materials

- Assorted images depicting extinct animals
- Paper copies of the texts
- A selection of fact sheets (with photographs) on various extinct animals

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

CLIL for STEAM
Project Number: 2019-1-PL01- KA201-065027

Hydrocarbons and the climate change

Teacher	Country	School
Vatavu Mihaela Adela Serea	Romania	EuroEd Secondary School, Paunescu School for children with special needs

Students' Age	Subject	Topic	Students' target level of competence (CEFR)	Language Skills
16-17	• Biology • Chemistry	Hydrocarbons	B2	• Listening • Speaking • Reading • Writing • Interaction

Learning objectives (related to curriculum content)

The aim of this learning scenario is to explain and understand one of the most important causes of the phenomenon of global warming - the carbon dioxide release by fossil fuel combustion, and the effect of high atmospheric carbon dioxide on climate change.

Learning outcomes

Students will be able to:

- Learn that fossil fuels are primarily composed of hydrocarbons
- Compare the products of combustion of various hydrocarbons
- Explore the thermal properties of carbon dioxide and air
- Interpret how the combustion of fossil fuels may release greenhouse gases such as CO_2 in the atmosphere and may potentially contribute to global warming

Cognitive skills

- Listing fossil fuels
- Matching key words with their definitions
- Describing different processes and reactions
- Sequencing the stages of an experiment
- Carrying out an experiment
- Calculating the carbon footprint
- Showing differences between the results of an experiment
- Expressing hypotheses on an experiment

Language Function

- Identifying
- Predicting
- Evaluating
- Classifying
- Comparing and contrasting

Key language

Vocabulary:

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Organic chemistry, carbon, methane, hydrocarbons, aliphatic, aromatic, chains, rings, ethane, ethane, ethyne, combustible, carbon dioxide, fossil fuel, emissions, coal, greenhouse gases, natural gas, petroleum, oil, ocean acidification, sustainable, climate change

Verb:

- To release, to heat, to affect

Language structure:

- Sequencing
- Present simple
- Adjectives and comparatives
- Passive voice in the present and past
- Past simple
- Future simple for hypothesizing

Activities

Lesson 1 - Hydrocarbons and fossil fuels – 1 h

The students already have basic knowledge about hydrocarbons. Before the lesson, at home, they had previously watched the video https://youtu.be/s-oYAn8j7YY - Hydrocarbons - alkanes, alkenes and alkynes and done the interactive exercise https://wordwall.net/resource/50353/hydrocarbons-match-up.

In class, the teacher checks the answers of their home assignment and then writes the reaction between a hydrocarbon and oxygen, asking the students to say what the resulted compounds are and what else is produced through this reaction. After eliciting the answer (water and carbon dioxide, and energy), the teacher invites the students to watch https://youtu.be/poHN_kUWPtw - What's the deal with fossil fuels? While watching the video, the students will have to take notes so that they could answer the following questions: *What are fossil fuels?/ What are the three main types of fossil fuels? How did they form, and how long did it take?/ How do fossil fuels produce energy?/ What is petroleum used for?/ What are some of the benefits of fossil fuels? What are some of their drawbacks? /What everyday items are made from oil?* After watching the video the teacher and the students discuss their answers, insisting on the specific vocabulary which will be used for a glossary. As an aid for retaining the most important terms, the students do the interactive matching exercise: https://wordwall.net/resource/18795267/fossil-fuels.

To demonstrate the products of the combustion of different hydrocarbons and to show the potential costs and benefits of using different fossil fuels, the teacher invites the students to explore the topic in greater detail through this reading titled "Hydrocarbon Combustion"- https://energyeducation.ca/encyclopedia/Hydrocarbon_combustion. The teacher divides the students into six groups and asks them to read the text and afterwards to choose a fuel from the drop down menu (butane, ethanol, hydrogen, methane, methanol and propane) to see the net reaction that occurs during combustion. After doing the experiment, the students will have to note how much CO_2 per molecule is released due to the combustion of different fossil fuels and to describe each reaction and its results to the class.

As home assignment, the students have to watch the videos https://youtu.be/MwcQ8rX80aM - The Biogeochemical Cycle of Carbon and https://youtu.be/_Fq7HTY2r7M - The Greenhouse Effect and make notes on the carbon cycle in the ecosystem and the greenhouse gases that trap heat in the Earth's atmosphere, causing the Earth to warm up.

Lesson 2 – Hydrocarbons and climate change – 1 h

In order to check the students' understanding of the videos they had as home assignment, they do the following interactive exercise: https://wordwall.net/resource/3311715/clil4steam-global-warming.

The teacher shows the students some pictures representing dramatic climate change and asks them what they think the main cause is. Eliciting the answer 'global warming' or 'greenhouse effect', the teacher asks the students to discuss what the role of carbon dioxide, as a greenhouse gas is, and how increased CO_2 concentrations, due to combustion of different hydrocarbons in fossil fuels, may contribute to global warming.

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

The students watch the video https://www.youtube.com/watch?v=kwtt51gvaJQ - The Greenhouse Gas Demo, which shows an experiment on how carbon dioxide traps the thermal radiation and acts like a greenhouse gas. The students are divided in four groups, each group being given the materials necessary to conduct a similar experiment; 2 plastic bottles, corks with holes for thermometers, two thermometers, a lamp, vinegar and baking soda to produce carbon dioxide for each group. The teacher goes from one group to another to help the students set the experiment. Each group is given an observation sheet, containing the following rubrics: *Starting temperature/ Duration of the observation /Change in temperature.* Before conducting the experiment, the teacher asks the students to make hypothesis on what will happen*: I think that simulating adding carbon dioxide and other greenhouse gases to the air will cause the temperature in a container to increase/ decrease/ stay the same. I think the temperature change will be _____ degrees different than the container without simulated greenhouse gases.* The teacher announces the students that the time for observing the changes in temperature for both media is 20 minutes.
In the meanwhile, the students will calculate their footprints using https://www.footprintcalculator.org/ and compare the results with the colleagues'.
At the end of the lesson, the students in each group will work collaboratively to write a paragraph about the experiment using sequencing (*First we put water in the plastic bottles*. *Next we added baking soda and vinegar in one of the bottles…).* In the end of the paragraph the students will compare their hypotheses with the results of the experiment.
The students present their written tasks in class.

Assessment FOR learning

- Teacher monitors individual, pair and group activities
- Students participate in all tasks and activities
- Students work autonomously to perform the experiment
- Students interact with partners (speaking creatively)
- Students present the account of their experiment
- Students collaborate in writing a paragraph

Assessment OF learning

Written paragraphs describing the experiment and its results

Material, resources, web tools

Video Lessons

- https://youtu.be/s-oYAn8j7YY - Hydrocarbons - alkanes, alkenes and alkynes
- https://youtu.be/MwcQ8rX80aM - The Biogeochemical Cycle of Carbon
- https://youtu.be/_Fq7HTY2r7M - The Greenhouse Effect

Reviewed Teaching Resources

- https://wordwall.net/resource/50353/hydrocarbons-match-up
- https://wordwall.net/resource/3311715/clil4steam-global-warming

Other Resources

- https://youtu.be/poHN_kUWPtw - What's the deal with fossil fuels?
- https://sciencing.com/examples-secondary-pollutants-5314906.html - Effects of Hydrocarbons on the Environment
- https://energyeducation.ca/encyclopedia/Hydrocarbon_combustion
- https://wordwall.net/resource/18795267/fossil-fuels
- https://www.youtube.com/watch?v=kwtt51gvaJQ - The Greenhouse Gas Demo
- https://sciencing.com/examples-secondary-pollutants-5314906.html
- https://www.footprintcalculator.org/

Materials

- 2 plastic bottles
- Corks with holes for thermometers
- Two thermometers
- A lamp
- Vinegar and baking soda

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

CLIL for STEAM
Project Number: 2019-1-PL01- KA201-065027

Is it real or just an illusion?

Teacher	Country	School
Elza Gheorghiu Vlad Orza Marius Patras	Romania	EuroEd Secondary school

Students' Age	Subject	Topic	Students' target level of competence (CEFR)	Language Skills
15-16	• Physics • Technology • Arts	Tricks of the light	B1	• Listening • Speaking • Reading • Writing • Interaction

Learning objectives (related to curriculum content)

The aim of this learning scenario is to introduce students to the concept of optical illusions and the way they are produced, how they apply to the real world, and how art can trick the eye.

Learning outcomes

Students will be able to:

- Define the term optical illusion
- Identify the various types of optical illusion and describe them
- Understand how individual perspective can affect how an optical illusion is viewed
- Understand the tricks that optical illusions play on the brain
- Create their own flipped book

Cognitive skills

- Identifying different types of optical illusions
- Defining optical illusions
- Giving examples of optical illusions
- Describing how optical illusions work
- Analysing the three types of optical illusions
- Matching specific words with their definitions
- Creating flipped books
- Presenting a project

Language Function

- Asking questions
- Comparing and contrasting
- Clarifying what has been said
- Analysing
- Defining

Key language

Vocabulary:

- Literal illusion, cognitive illusion, physiological illusion, reflection, retina, tricks of light, rainbow, mirage, animation, flipped book, perception, sensations

Verb:

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

- To perceive, to sense, to play tricks

Language structure:

- Present Simple
- Passive voice in the present
- Adjectives and comparatives

Activities

Lesson 1 – Optical illusions and the physics behind them – 1 h

The teacher starts the lesson by writing the following words on the board: *sight, perception, sensation, eye, brain, light, illusion*. Then the teacher invites the students to talk about a time when they "thought" they saw one thing and it turned out to be something quite different. After collecting the answers, the teacher explains that perception and sensation may be two different things: sensation is what our eyes see (sight), perception is what our brain sees; sensation is the same for everyone, while perception is different for everyone. Then the teacher tells the students that the words on the board are related to sensation and perception: sight is the primary sense used to intake visual information, but then the brain must interpret this information, and sometimes our brain misinterprets, or is tricked into seeing things differently than they actually appear. Then the teacher presents the topic of the lesson: optical illusions, which occur everywhere in our world, be they created or natural.

Then the teacher invites the students to watch https://www.youtube.com/watch?v=UfVzDrlypnU - How Optical Illusions Trick Your Brain. The teacher pauses the video to discuss the following questions as a class: *What is an optical illusion? How does an optical illusion work? What examples of optical illusions have you seen in your life?* After each illusion is presented in the video, the teacher presses the pause button to allow the students analyse them and then discuss about it. After watching the video, the teacher divides the students into three main groups, each group being assigned to a type of optical illusion: cognitive, literal and physiological, and asks the students in each group to work collaboratively and complete a table with the following rubrics: *Type of illusion/ Definition/ How this optical illusion works.*

To reinforce students' learning, the teacher displays a number of examples of optical illusions and asks the students to discuss each one.

The teacher explains to the students that for a better understanding of the science behind the optical illusions, they will have to watch the following videos at home: https://youtu.be/zHi6i-QAYj0 - Reflection and Refraction and https://youtu.be/hBWld3W03vA - Lenses: Way of light through lenses, and do the following interactive exercises: https://quizlet.com/gb/457715530/the-eye-and-lenses-flash-cards/ and https://quizlet.com/604277622/lenses-and-the-human-eye-flash-cards/?new .

Lesson 2 –Our everyday life and optical illusions– 1 h

The teacher checks the students' understanding of the assignment by asking them to fill in a concept map about lenses and the human eye (https://wordwall.net/resource/19306801/lenses-human-eye).

Then the teacher explains to the students that optical illusions are part of our lives and shows the students four pictures representing a TV, a cartoon, a rainbow and a mirage. The teacher asks the students what they think these pictures have in common and elicits the answer that they are based on optical illusions. Then the teacher asks the students to watch a video about animation basics: https://youtu.be/V8A4qudmsX0 and then do the quiz https://ed.ted.com/lessons/animation-basics-the-optical-illusion-of-motion-ted-ed/review_open#question-1

Then the teacher divides the students into groups of four and asks the students read the article https://fliptomania.com/did-you-know/ about the history of flipbooks and moving images. The students have to read the text and fill in a gapped text containing information about flipbooks and their history.

Then the teacher pairs up the students and asks them to watch https://youtu.be/Un-BdBSOGKY - How to MAKE A FLIPBOOK. which gives explanation how to make an easy flip book to test how cartoons are made. Students use different patterns to make their own flipped book and present them to the class.

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

In the end of the lesson the teacher starts a discussion from the following questions: *How do optical illusions make you feel when you look at them?* (uncomfortable, crazy, impressed) / *Why do you think some people find optical illusions to be more interesting than traditional art*? / *Which type of optical illusion did you like the most? How do illusions affect our perception?/ Why do optical illusions trick your brain?*

As home assignment the teacher asks the students watch https://youtu.be/YGuytw5Ry20 - Trick of The Light 1: Rainbows and https://youtu.be/TlexLNla7Xc - Tricks of Light 2: Mirages and write a short paragraph for each video in which they should state the causes that produce both rainbows and mirages.

Assessment FOR learning

- Teacher monitors individual, pair and group activities
- Students participate in all tasks and activities
- Students complete information gaps
- Students autonomously find information and use it
- Students interact with a partner (speaking creatively)

Assessment OF learning

- Presentation of a flipped book

Material, resources, web tools

Video Lessons

- https://youtu.be/YGuytw5Ry20 - Trick of The Light 1: Rainbows
- https://youtu.be/TlexLNla7Xc - Tricks of Light 2: Mirages
- https://youtu.be/hBWld3W03vA - Lenses: Way of light through lenses
- https://youtu.be/zHi6i-QAYj0 - Reflection and Refraction

Reviewed Teaching Resources

- https://wordwall.net/resource/3206953/tricks-light-unscramble-12-words

Other Resources

- https://www.thesun.co.uk/news/10113002/optical-illusions-tricks-light-so-perfect-hard-believe-not-photoshopped/
- https://www.youtube.com/watch?v=UfVzDrlypnU - How Optical Illusions Trick Your Brain
- https://thebrain.mcgill.ca/flash/a/a_02/a_02_p/a_02_p_vis/a_02_p_vis.html
- https://quizlet.com/gb/457715530/the-eye-and-lenses-flash-cards/
- https://quizlet.com/604277622/lenses-and-the-human-eye-flash-cards/?new
- https://ed.ted.com/lessons/animation-basics-the-optical-illusion-of-motion-ted-ed
- https://ed.ted.com/lessons/animation-basics-the-optical-illusion-of-motion-ted-ed/review_open#question-1
- https://youtu.be/V8A4qudmsX0
- https://youtu.be/Un-BdBSOGKY - How to MAKE A FLIPBOOK
- https://fliptomania.com/did-you-know/
- https://wordwall.net/resource/19306801/lenses-human-eye

Materials

- Paper
- Scissors
- Two binder clips
- Coloured markers, highlighters, pencils or crayon

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

CLIL for STEAM
Project Number: 2019-1-PL01- KA201-065027

Lenses and the human eye

Teacher	Country	School
Vatavu Mihaela Cristina Farzi	Romania	EuroEd Secondary School, Paunescu School for children with special needs

Students' Age	Subject	Topic	Students' target level of competence (CEFR)	Language Skills
16-17	• Physics • Biology • Arts	Lenses and the human eye	B2	• Listening • Speaking • Reading • Writing • Interaction

Learning objectives (related to curriculum content)

The aim of this learning scenario is to understand the optical principles for lenses, to explain how the human eye produces images of distant and nearby objects and to investigate some of the common vision problems.

Learning outcomes

Students will be able to:

- Define refraction
- Explain how light refracts differently through different materials
- Know the mechanism of vision in human eye
- Collect information regarding the diseases affecting the eye

Cognitive skills

- Matching specific words with the definitions
- Describing how lenses work
- Giving examples of lenses in everyday life
- Identifying different parts of the eye especially the layers of the eyeball
- Outlining the structure of the eye
- Observing how vision is formed
- Analysing, justifying and giving solutions to eyesight problems

Language Function

- Asking questions
- Agreeing or disagreeing
- Interpreting
- Clarifying what has been said

Key language

Vocabulary:

Light, straight lines, refraction, angle, image, transparent, refractive index, bending, lens, cornea, pupil, retina, iris, optic nerve, ciliary muscles, accommodation, myopia, hyperopia, presbyopia, astigmatism

Verb:

- To refract, to bend, to accommodate

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Language structure:

- Present simple
- Passive voice in present
- Wh-Questions
- Adjectives

Activities

Lesson 1 – Refraction and lenses – 1 h

The teacher shows students a picture representing a beautiful landscape and asks them if the picture is beautiful and how do they sense that, what sense organ helps in seeing. Then he/she announces that they are going to learn about how vision is formed and what processes are involved in producing an image.
The students have previous knowledge about refraction, as well as of the structure of the human eye. The teacher draws a picture of a light ray refracted in the water and asks the students to label it, giving explanations for the specific terms.
The teacher asks the students to watch https://youtu.be/zHi6i-QAYj0 - Reflection and refraction from minute 3:27 and tells them that while watching they have to solve the quiz in the following worksheet: https://wordwall.net/print/9420044/refraction. Then the teacher starts a discussion about the use of refraction in everyday life and which one can be linked to the human vision, then elicits the responses. Before going to the next step, the teacher pairs up the students and asks them to work collaboratively in order to match the terms related to refraction and lenses to their definitions. Then the students watch the video explanations https://youtu.be/hBWld3W03vA - Way of light through lenses, and check if their answers were correct.

As home assignment, the students have to watch the video https://www.youtube.com/watch?v=nbwPPcwknPU about the anatomy of the human eye and then label a picture of the eye.

Lesson 2 – The human eye, vision, and problems – 1 h

The teacher checks the home assignment.

The teacher starts a discussion with the students by asking them: *How does the human eye see? How does the eyeball work? Why do some people have better eyesight than others? Why do some people need glasses? Why do some people need them for distance and some need them for reading?* After eliciting answers from students, the teacher tells them that they are going to see to what extent their hypotheses were correct, by watching a video: https://www.science.org.au/curious/video/vision, after which they will have to answer the quiz: https://wordwall.net/resource/19281159/how-vision-works.
The teacher shows a picture of a person wearing glasses and asks the students to make assumptions about what his sight problem might be. The teacher then divides the students into four groups and assigns each group a vision problem: *myopia, hyperopia, presbyopia,* and *astigmatism.* Each group is given a handout with a frame containing the rubrics: *Problem/ Cause/How it manifest/ How to correct it.* The students have to watch the video https://www.youtube.com/watch?v=03rWzOrDss4&list=PL4OzcNJbbOcTYwOuig5cxIm-nvR72f0mr - The Human Eye: Accommodation and Presbyopia, and work collaboratively to fill in the frame according to the assignment. After they finish, they share their findings with their colleagues.
In the end, the students are given a final evaluation test they have to do: https://quizizz.com/admin/quiz/5f8711418d944b001b6ecd44/human-eye-and-optical-instruments

Assessment FOR learning

- Teacher monitors individual, pair and group work
- Students successfully play matching games
- Students are autonomous researchers
- Students participate successfully in all tasks and activities
- Students complete information gaps
- Students do self and peer assessment

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Assessment OF learning

Students complete the final evaluation test.

Material, resources, web tools

Video Lessons

- https://youtu.be/zHi6i-QAYj0 - Reflection and refraction
- https://youtu.be/hBWld3W03vA - Way of light through lenses

Created Teaching Resources

- https://clil4steam.pixel-online.org/teaching-resources-sch.php?id_asch=199&section_asch=review

Reviewed Teaching Resources

- https://wordwall.net/resource/8752450/physics/lenses-match-up-quiz

Other Resources

- https://wordwall.net/print/9420044/refraction
- https://www.science.org.au/curious/video/vision - How vision works
- https://wordwall.net/resource/19281159/how-vision-works
- https://learning-center.homesciencetools.com/article/eye-and-vision/
- https://www.youtube.com/watch?v=nbwPPcwknPU – The human eye
- https://youtu.be/03rWzOrDss4?list=PL4OzcNJbbOcTYwOuig5cxIm-nvR72f0mr - The Human Eye: Accommodation and Presbyopia
- https://quizizz.com/admin/quiz/5f8711418d944b001b6ecd44/human-eye-and-optical-instruments

Materials

- Posters
- Concept maps
- Multimedia: visual, auditory, digital

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

CLIL for STEAM
Project Number: 2019-1-PL01- KA201-065027

Lenses: Way of light through lenses

Teacher	Country	School
Andrius Storta	Lithuania	Trakų Vytauto Didžiojo gimnazija

Students' Age	Subject	Topic	Students' target level of competence (CEFR)	Language Skills
14-16	• Math • Physics	Lenses	B2 C1	• Listening • Speaking • Reading • Writing • Interaction

Learning objectives (related to curriculum content)

The learning scenario is projected to present and explain the the concept of light travelling (in English terminology). The scenario aims to engage the reflection on listening and watching experience and share the it with the peers, classmates, also to to reinforce the learning by carrying out simple experiments.

Learning outcomes

Students will be able to: to describe how light travels in straight lines and that this mechanism changes depending on the medium that the light is passing through.
Students will understand the difference between convex and concave lenses.
Students will understand the fundamentals of visual perception.
Students will be able to describe how beam of light refracting in lenses, draw the way of light trough the lenses, identify differences between diffuse and close-up lenses, solve tasks using law of light refraction and formula of focal length of the lens, use basic of trigonometry (sin, cos).

This learning scenario is aimed at students of 14-18 years old.

Cognitive skills

Attention, perception, observation, memorising, analytical, critical thinking, communication, collaborative learning, self-directed learning and problem solving skills.

Language Function

- Comparing and contrasting: X is similar to.../ X differs from Y in that
- Giving definition using relatives: X is a ...which....
- Expressing opinions and asking for opinions: What do you think about.....?/ My opinion is that.....What's yours?
- Classifying: The two types of....are....

Key language

Vocabulary:

- Light, rays, sight, lens, lenses, convex, concave, convergent, diverging, refraction, straight, retina, focal point, direction, spectacles, optic nerve, mirror, microscope, position, object, reflection, prism, optical axis, focal plane, principal plane, glass, curvature, surface, slab, farsightedness, nearsightedness, correction, cornea, iris, pupil, nerve cells, cones, rods, optic nerve, spherical shape, anatomy, camera, telescope, photography, incidence, eye structure, eyelid, eyelashes, white protective coat, sclera, side view, blind spot.

Verb:

- Travel, focus, magnify, ground, adjust

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Adjectives:

- Magnified, outer

Language structure:

- Present simple tense, conditional sentence construction, object description

Activities

The time required to complete the learning scenario is 6 hours.
Phase 1: 1 hour (1 hour in-class + 10 min home assignment)
Phase 2: 2 hours (1 hour in-class + 1 hour home assignment)
Phase 3: 2 hour (1 hour in-class + 1 hour home assignment)
Phase 4: 1 hour in class

Phase 1: a teacher selects key vocabulary items that learners need to know and understand to be able to process the input in the videos and tasks. After that students watch video lesson - Lenses: Way of light through lenses:
https://clil4steam.pixel-online.org/video-library-sch.php?id_asch=10
as a basic introduction to light refraction and lenses, explaining how light rays pass through concave and convex lenses.
Students take notes of the main terms and questions for the teacher if there were unclear moments. After the video to teacher asks basic terms and answers to the questions of the students.
Next video: Lenses – a short history of optics
https://clil4steam.pixel-online.org/tr_reviewed-sch.php?id_asch=199&section_asch=review
The video suggests that practical matters led to the advancement of optics. It also presents instruments (microscope, telescope etc.) that enhanced vision by allowing us to see things that aren't visible to the naked eye.
The teacher provides pupils with language support both in a target language and the mother tongue.
The teacher elicits information about the domains lenses are used in daily life (photography, astronomy, biology). The students will work in groups and write down the information on a worksheet.
After watching the video, the students will label basic definitions with specific terms in a jumbled order
https://clil4steam.pixel-online.org/tr_created-sch.php?id_asch=30&section_asch=creation
Homework – 10 min. the quiz that aims to reinforce the vocabulary and keywords found in the script for the video on lenses.
https://clil4steam.pixel-online.org/tr_created-sch.php?id_asch=62&section_asch=creation

Phase 2: the teacher shows how to correctly draw the way of the light through the lenses, how to measure angles of incidence and refraction, the distance between lens, body and this image.
Using virtual demonstrations, students will be able to distinguish types of lenses and explain key concepts that describe lenses. The teaching resource helps to better understand the theoretical material before doing the laboratory experiment:
https://clil4steam.pixel-online.org/tr_reviewed-sch.php?id_asch=91&section_asch=review
Students will perform virtual experiments working in groups of four. Students will be able to answer the questions: What is a lens? What are the different types of lenses? What properties describe lenses? How does the image change when the position of the lens and the object changes?
Each group has to choose only one of the four links (4, 5, 6, 7) to answer the question given and explain why that particular link helped them to answer the question.
The teaching material help students visually understand light reflection and refraction. Having examined a triangular prism, students will be able to explain how it is similar to a lens.
Conclude what the same matter ratio between the angle of incidence and refraction is the same size. Apply the refraction law and formula of focal length of the lens to determine unknown units: angle of: incidence, refraction, index of refraction, the distance between lens, body and this image. Also, students will compare the light way through a prism and water, find similarities.

Homework (C1): Students will read the article and study the image - Manufacturing optical lenses
https://clil4steam.pixel-online.org/tr_reviewed-sch.php?id_asch=184&section_asch=review
Students will have the assignment to prepare the summary of the article and to add new words in the topic vocabulary. In the next lesson at the beginning, they will work in pairs describing the main points in Manufacturing optical lenses.

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Phase 3: 1 hour in-class + 1 hour home assignments
The students will watch the video:
https://www.youtube.com/watch?v=uuWb1L2Vwsk
The teacher reinforces the vocabulary related to the eye (eye structure, pupil, eyelid, eyelashes, iris, white protective coat, sclera, optic nerve, cornea, side view, lens, retina, blind spot, and optic nerve).
The teacher shows students a picture of an eye, a camera, and a telescope and asks the students what they have in common. After eliciting that all of them use lenses, the teacher explains what a lens does and how these focusing systems use lenses.
The students will watch another video about how the eye works and work in pairs to take notes about the way the image is formed on the retina: https://www.youtube.com/watch?v=YcedXDN6a88.
To reinforce the specific vocabulary, they will do an interactive exercise: https://wordwall.net/resource/8752450
Homework:
https://clil4steam.pixel-online.org/tr_reviewed-sch.php?id_asch=39&section_asch=review
The teacher will set the class into three groups and assign one text to read at home to each group:
The anatomy of the eye
https://www.physicsclassroom.com/class/refrn/Lesson-6/The-Anatomy-of-the-Eye
Farsightedness and its correction https://www.physicsclassroom.com/class/refrn/Lesson-6/Farsightedness-and-its-Correction
Nearsightedness and its correction https://www.physicsclassroom.com/class/refrn/Lesson-6/Nearsightedness-and-its-Correction
Students read the text individually and take notes on the assigned issues.

Phase 4: 1 hour in class
Students discuss their findings in their group, they will compare their notes about the disorder and then they have to present the notes to the rest of the class and use the photos provided by the site to explain their part/section of the process.

Assessment FOR learning

The teacher will question the students and will provide the feedback this way helping students to understand what successful work looks like for each task they are doing (for example – summarizing the content in the video or article, describing the equation or scheme).

Assessment OF learning

Students will be assessed at the end of the unit. They will have to answer questions, solve problems, complete a presentation or write essays/reports according to the requirements of the national curriculum.

Material, resources, web tools

Video lesson

- https://clil4steam.pixel-online.org/video-library-sch.php?id_asch=10

Created teaching resources

- https://clil4steam.pixel-online.org/tr_created-sch.php?id_asch=30&section_asch=creation
- https://clil4steam.pixel-online.org/tr_created-sch.php?id_asch=62&section_asch=creation

Reviewed teaching resources

- https://clil4steam.pixel-online.org/tr_reviewed-sch.php?id_asch=38&section_asch=review
- https://clil4steam.pixel-online.org/tr_reviewed-sch.php?id_asch=91&section_asch=review
- https://clil4steam.pixel-online.org/tr_reviewed-sch.php?id_asch=184&section_asch=review
- https://clil4steam.pixel-online.org/tr_reviewed-sch.php?id_asch=199&section_asch=review
- https://clil4steam.pixel-online.org/tr_reviewed-sch.php?id_asch=39&section_asch=review

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

CLIL for STEAM
Project Number: 2019-1-PL01- KA201-065027

Let's go into orbit! Kepler's Three Laws Explained

Teacher	Country	School
Annalisa Bassi	Italy	IIS Montale Nuovo IPC

Students' Age	Subject	Topic	Students' target level of competence (CEFR)	Language Skills
16-17	• Physics • Math	Kepler's Three Laws Explained	B1	• Listening • Speaking • Reading • Writing • Interaction

Learning objectives (related to curriculum content)

The linguistic objectives are to teach students a correct scientific language and to give them the necessary instruments to be able to read and study a scientific article, to be able to watch and understand a video about the planets' orbit.

- The specific objectives are
- To be able to frame the scientific findings in a historical contest.
- To know and to understand the gravitational law and the consequences, for example the motion of planets and satellites
- To know, to understand and to explain the three laws of Kepler
- To observe the world around us with curiosity to understand at least in part the technology that we use every day.
- To develop critical thought to be able to see the positive and negative consequences of scientific findings and technological applications.

Learning outcomes

Students will be able to:

- To understand that Physics is a discipline closely linked to other disciplines, in particular History, Philosophy and Science. The development of scientific thought with its subsequent discoveries and applications must be framed in a historical, logical and chronological context.
- To acquire and to interpret information in a critical way through different contexts and through different communicative instruments.
- To estimate scientific credibility of the source and to discern the difference between facts and opinions.
- To communicate and to understand different languages (daily, technical, literary, scientific) and to use them in different contexts.

Cognitive skills

To develop the observation skills and the ability to make connections and suppositions. To be able to be engaged in team work. To acquire and interpret information in a critic way through different contexts and through different communicative instruments.
To estimate the scientific credibility of the source and to discern the difference between facts and opinions

Language Function

- Comparing
- Describing
- Evaluating and Explaining
- Identifying
- Inquiring/Questioning
- Reporting

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

- Sequencing

Key language

Vocabulary:

- All the vocabulary in the glossary in the video Let's go into Orbit! And in the video Force of gravity and in the created resource Orbit

Language structure:

- Present simple and present continuous tense; adverbs of frequency; future tenses (will, present continuous, to be going to); modal verbs for deductions (may, can't, must); If clauses 1st type; imperative form

Activities

Phase 1: The Universal Law of Gravitation. https://www.youtube.com/watch?v=c9shwPMpSq8
The Universal Law of Gravitation
https://www.youtube.com/watch?v=l0cO3v1aXms
How Does Gravity Work?
https://www.youtube.com/watch?v=0hOuNtRMSAI
Calculating the gravitational force

One hour to watch the first 3 videos. The teacher presents the video and comments with the class. The teacher must enrich the resource with explanations about the earth's gravity and the universal law of gravitation.

Phase 2: Explained In 5 Questions: Kepler's Law of Planetary Motion | Encyclopaedia Britannica. https://www.youtube.com/watch?v=AKbfR5KHUm4&t=140s
Explained In 5 Questions: Kepler's Law of Planetary Motion | Encyclopaedia Britannica
https://www.youtube.com/watch?v=kyR6EO_RMKE
Kepler's Three Laws Explained
https://www.youtube.com/watch?v=vbD1fNiWWfo
Orbital Velocity Explained
Two hours to watch the other 3 videos and to add the explanation of the topic. Another hour can be dedicated to the conic sections, as a further deepening. The teacher must point out the connection between the equation and the graph and the importance of eccentricity. Also the teacher can introduces other physic phenomena which can be explain whit the conic. Important is the connection between gravity and circular motion of satellite.

Phase 3: Exercises about calculating the gravitational force. Through the exercises the students understand that this force is so small to become insignificant if it is applied to little objects, but it becomes very important when it is applied to masses like the earth and the planets.
It can be an interesting exercise to calculate the different gravity accelerations on other planets.

Phase 4: Exercises about: Kepler's Law: to compare the planet's orbit, to calculate the different eccentricities, the periods of revolution around the sun, the different length of the seasons on the earth and the orbital velocity of a satellite.

Assessment FOR learning

In phases 3 and 4 the students are very active: they are asked to apply what they have learned. So they need to focus on the three key-questions of "Assessment for learning": What do I know? What do I want to learn? What have I learnt? The production of a Portfolio or an Oral Presentation could be useful to achieve awareness of the student's learning process.

Assessment OF learning

Assessment of learning will be achieved at the end of the phases, after the students have been involved in their research. It will test the content of the learning module: the gravitational law and the laws of Kepler. Part of the final grade will test the use of the correct language structures (present simple and present continuous tense; adverbs of frequency; future tenses (will, present continuous, to be going to); modal verbs for deductions (may, can't, must); If clauses 1st type; imperative

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

form). A short essay or report could be used for this purpose as it will allow the teacher to test both the content and the language.

Material, resources, web tools

Video lesson

- https://www.youtube.com/watch?v=APIIX6HUVI8&ab_channel=CLIL4SteamProject
- https://www.youtube.com/watch?v=9blaY6W41dg&ab_channel=CLIL4SteamProject

Reviewed teaching resources

- https://clil4steam.pixel-online.org/tr_created-sch.php?id_asch=20&section_asch=creation
- https://clil4steam.pixel-online.org/tr_created-sch.php?id_asch=21&section_asch=creation
- https://clil4steam.pixel-online.org/tr_created-sch.php?id_asch=36&section_asch=creation
- https://clil4steam.pixel-online.org/tr_created-sch.php?id_asch=34&section_asch=creation

Reviewed teaching resources

- https://www.youtube.com/watch?v=c9shwPMpSq8
- https://www.youtube.com/watch?v=l0cO3v1aXms
- https://www.youtube.com/watch?v=0hOuNtRMSAI
- https://www.youtube.com/watch?v=AKbfR5KHUm4&t=140s
- https://www.youtube.com/watch?v=kyR6EO_RMKE
- https://www.youtube.com/watch?v=vbD1fNiWWfo

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

CLIL for STEAM
Project Number: 2019-1-PL01- KA201-065027

Let's go into orbit! Satellites

Teacher	Country	School
Annalisa Bassi	Italy	IIS Montale Nuovo IPC

Students' Age	Subject	Topic	Students' target level of competence (CEFR)	Language Skills
16-17	• Physics • Math	Satellites	B1	• Listening • Speaking • Reading • Writing • Interaction

Learning objectives (related to curriculum content)

The linguistic objectives are to teach students a correct scientific language and to give them the necessary instruments to be able to read and study a scientific article, to be able to watch and understand a video about the planets' orbit.

- To be able to frame the scientific findings in a historical contest.
- To know and to understand the gravitational law and the consequences, for example the motion of planets and satellites
- To know, to understand and to explain the three laws of Kepler
- To observe the world around us with curiosity to understand at least in part the technology that we use every day.
- To develop critical thought to be able to see the positive and negative consequences of scientific findings and technological applications.

Learning outcomes

Students will be able to:

- To understand that Physics is a discipline closely linked to other disciplines, in particular History, Philosophy and Science. The development of scientific thought with its subsequent discoveries and applications must be framed in a historical ,logical and chronological context.
- To acquire and to interpret information in a critical way through different contexts and through different communicative instruments.
- To estimate scientific credibility of the source and to discern the difference between facts and opinions.
- To communicate and to understand different languages (daily, technical, literary,

Cognitive skills

To develop the observation skills and the ability to make connections and suppositions. To be able to be engaged in team work. To acquire and interpret information in a critic way through different contexts and through different communicative instruments.
To estimate the scientific credibility of the source and to discern the difference between facts and opinions.

Language Function

- Comparing
- Describing
- Evaluating and Explaining
- Identifying
- Inquiring/Questioning
- Reporting
- Sequencing

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Key language

Vocabulary:

- All the vocabulary in the glossary in the video Let's go into Orbit! And in the video Force of gravity and in the created resource Orbit

Language structure:

- Present simple and present continuous tense; adverbs of frequency; future tenses (will, present continuous, to be going to); modal verbs for deductions (may, can't, must); If clauses 1st type; imperative form

Activities

Phase 1: What Keeps Satellites in Orbit?.
https://www.youtube.com/watch?v=DVF3rK6ML_8
What Keeps Satellites in Orbit?
https://www.youtube.com/watch?v=qbXUjeYMx_I
Why Satellites don't fall back to EARTH? Why Satellite stays in ORBIT?

Two hours to watch the 2 videos. The teacher presents the videos and comments on them with the class. The videos can also be used with a flipped class methodology asking the students to watch the videos at home and then to report to the class. The teacher must enrich the resource with explanations and remind the student what laws are involved to explain the motion of the satellites

Phase 2: How do satellites work?
https://www.youtube.com/watch?v=ror4P1UAv_g
How do satellites work? ICT # 10

One hour to watch the video and to explain the importance and the rule of artificial satellites in own life . The teacher must open a discussion with the students to understand how much they know about the satellites and if they are aware that whenever they use for example, the television or the internet they exploit the work of the satellites. The teacher will help the students to get to know other types of satellites and how they are used. It is important for the teacher to focus the discussion about the very use that men can make of the satellites.

Phase 3: The students , as homework, must find out all the uses of the satellites, and in a second time must report these research.

Phase 4: Artificial satellites.
https://www.sciencelearn.org.nz/resources/269-artificial-satellites
Artificial satellites- science learning hub
Two hours are necessary for this video because
It is more specific and the teacher must help the student to understand the different kinds of satellites and their uses. The students will present the resources found at home in phase 3.

Phase 5: The quest to conquer Earth's space junk problem.
https://www.nature.com/articles/d41586-018-06170-1
The first hour is used to read the article, to watch the videos inside it and to open a discussion with the students to understand how much they know about this big problem. Then the teacher splits the students into groups and gives each of them to look up additional resources as homework: one group must find scientific articles about space junk, the other must find about hints and opinions of scientists or other people to solve the problem of the overpopulation of zombie satellites. They must choose which resource they want to share and must present it in the next lesson. The second hour is used to look at and to comment on the new resources. This is the most delicate phase because the students must express their opinion. The first group presents the problem and the other group answers with their opinions. The lesson is carried out by the students as in a debate with the teacher as a moderator.

Assessment FOR learning

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

In all the five phases students are very active: they are asked to look for similar information on the web and to report about it to the class. They are also asked to take part in a class discussion and to support their ideas. So they need to focus on the three key-questions of "Assessment for learning": What do I know? What do I want to learn? What have I learnt? The production of a Portfolio or an Oral Presentation could be useful to achieve awareness of the student's learning process.

Assessment OF learning

Assessment of learning will be achieved at the end of the phases, after the students have been involved in their research. It will test the content of the learning module: the artificial satellites, the benefits and the problems associated. Part of the final grade will test the use of the correct language structures (present simple and present continuous tense; adverbs of frequency; future tenses (will, present continuous, to be going to); modal verbs for deductions (may, can't, must); If clauses 1st type; imperative form). A short essay or report could be used for this purpose as it will allow the teacher to test both the content and the language.

Material, resources, web tools

Video lesson

- https://www.youtube.com/watch?v=APIIX6HUVI8&ab_channel=CLIL4SteamProject

Reviewed teaching resources

- https://clil4steam.pixel-online.org/tr_created-sch.php?id_asch=20&section_asch=creation

Reviewed teaching resources

- https://www.youtube.com/watch?v=DVF3rK6ML_8
- https://www.youtube.com/watch?v=qbXUjeYMx_I
- https://www.youtube.com/watch?v=ror4P1UAv_g
- https://www.sciencelearn.org.nz/resources/269-artificial-satellites
- https://www.nature.com/articles/d41586-018-06170-1

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

CLIL for STEAM
Project Number: 2019-1-PL01- KA201-065027

Living in the World of Plastic

Teacher	Country	School
Marcin Paśnikowski	Poland	Szkoła Podstawowa nr 5 im. Janusza Kusocińskiego w Świdniku

Students' Age	Subject	Topic	Students' target level of competence (CEFR)	Language Skills
13-15	• Biology • Chemistry • Technology • Arts	Plastic pollution	A2 B1	• Listening • Speaking • Reading • Interaction

Learning objectives (related to curriculum content)

The objectives of the learning scenario are:

- Understanding a variety of the uses of plastic
- Understanding how plastic can be recycled
- Analysing the methods of recycling that are used in students' own homes
- Noticing the positive and negative aspects of plastic
- Predict the future of plastic

Learning outcomes

Students will be able to: This field is dedicated to describe how the students is able to apply the learning objectives
After applying this scenario students will be able to analyse the positive and negative impact of plastic in the world and will be able to discuss the ways to use it to recycle it.

Cognitive skills

- Naming various examples of plastic objects used in everyday life
- Analyzing the positive and negative aspects of the plastic
- Listing the ways plastic could be used in the future
- Naming the ways to recycle plastic

Language Function

Students will be able to:

- Name plastic objects used in everyday life
- Reading and understanding a simple text
- Listening and watching the video about plastic
- Describing a work of art

Key language

Vocabulary:

- Carbon, organic chemistry, natural, synthetic, man-made, proteins, amino acids, hydrocarbons, polythene, petroleum, polymers, polymer synthesis, plastic pollution, naturally occurring, crude oil, porous, refinery, fractional distillation, processes, cracking, reforming, high value, shaped, moulded, properties, chain, monomers, addition, condensation, unsaturated, polythene, addition, nylon, polyethene, polypropylene, polybutylene, polystyrene, pollution, valuable resource, rubbish, litter, non-biodegradable, recycling.

Co-funded by the Erasmus+ Programme of the European Union

Verb:

- Shape, mould, and recycle.

Language structure:

- The Present Continuous to express a gradual development of a process
- The Future Simple to express predictions about the future
- The Passive to present the action.

Activities

29) Students brainstorm ideas of the usage of plastic in everyday life.
30) Students read Chapter 1 of the eBook entitled "Take a Closer Look at Plastic" to find out more about the origin, impact and usefulness of plastic
31) Students have a group discussion about the negative impact of plastic on the environment and do some research concerning recycling policy at their school, town and country. They prepare a questionnaire to interview their schoolmates and relatives to find out how many people recycle plastic and in what way.
32) They continue reading the book to learn about the 3Rs: reduce, reuse and recycle
33) Students work individually. They create a list of 10 plastic everyday objects that they couldn't live without. Next, they form pairs and compare the lists, trying to come up with one list. They have to persuade their partners to cut down the number of objects. Finally, they form a group of 4 and do the same. Each group presents their final list to the rest of the class, discussing the ways they persuaded each other to reduce the list of plastic objects that seem necessary in everyday life
34) Students have a speaking activity - https://clil4steam.pixel-online.org/teaching-resources-sch.php?id_asch=105&section_asch=creation to practice English and prepare for the next task.
35) The teacher asks students to think of ways to reuse plastic and suggests organising an art exhibition of "garbage" art. Each group (3-4 students) has to create a sculpture or a picture using recycled plastic. Students also have to create an advertisement which will raise awareness about the problem and invite other schoolmates and community members to visit the exhibition. The finished sculptures will be displayed in the school hall to raise awareness of the school and local community.
36) As homework, students watch the videos to summarise what they have learnt and to practice new vocabulary..

Assessment FOR learning

Students evaluate their own knowledge by filling in a chart "Now I can".

Now I can	😃😃😃	😃😃	😃	😟	😟😟
name plastic objects used in everyday life					
list a variety of the uses of plastic					
understand how plastic can be recycled					
describe a work of art (sculpture, painting)					
understand the contents of the video about plastic in English					
read and understand a simple text about plastic					
analyse the methods of recycling that are used in my own homes					
notice the positive and negative aspects of plastic					
make predictions about the future of plastic					

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Project Number: 2019-1-PL01- KA201-065027

Assessment OF learning

Vocabulary quiz.

Material, resources, web tools

Video Lessons

- https://youtu.be/uXosZfD4kqY
- https://www.youtube.com/watch?v=pF72px2R3Hg

Created Teaching Resources

- https://clil4steam.pixel-online.org/teaching-resources-sch.php?id_asch=105&section_asch=creation

Other resources

- https://wordwall.net/resource/8367674/plastic-world-cloze-test
- https://www.getepic.com/app/read/62121

Co-funded by the Erasmus+ Programme of the European Union

Project Number: 2019-1-PL01- KA201-065027

Metals and our everyday life

Teacher	Country	School
Vatavu Mihaela Ioan Juncu Vlad Orza	Romania	EuroEd Secondary School, Vasile Alecsandri High School

Students' Age	Subject	Topic	Students' target level of competence (CEFR)	Language Skills
15-16	• Physics • Chemistry	Properties of metals 1: Physical Properties	B1	• Listening • Speaking • Reading • Writing • Interaction

Learning objectives (related to curriculum content)

The aim of this learning scenario is to understand the world of metals, to learn about their physical properties and to be able to differentiate between metals and non-metals through hands-on inquiry.

Learning outcomes

Students will be able to:

- Describe where metals are on the periodic table
- Describe metallic bonding
- To give examples of physical properties of metals
- Classify metals and non-metals based on their physical properties
- Compare the properties of metals and non-metals
- To learn and apply scientific concepts in simple real-life situations

Cognitive skills

- Identifying the common issue in a series of items
- Naming metals in the periodic table
- Reciting chemical elements
- Defining metal properties
- Classifying metal objects and their uses according to their properties
- Analysing and comparing materials
- Justifying a choice
- Conducting an experiment
- Presenting the conclusions of an experiment

Language Function

- Asking questions
- Comparing and contrasting
- Analysing
- Classifying
- Describing

Co-funded by the Erasmus+ Programme of the European Union

The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

CLIL for STEAM
Project Number: 2019-1-PL01- KA201-065027

Key language

Vocabulary:

- Physical, chemical, properties, metals, metallic, periodic table, elements, zig zag line, metallic bonding, atoms, bond, positively charged, cation, electrons, lattice, melting point, lustrous, shiny, conductors, electricity, malleable, tensile, ductile, sonorous, magnetic, cobalt, iron, nickel, tensile strength, ductile, wires

Verb:

- To bond, to melt, to conduct, to shine, to sound, to bend, to break

Language structure:

- Word formation
- Synonyms
- Present simple
- Passive voice in present
- Adjectives and comparatives

Activities

Lesson 1 – Metals and their physical properties – 1 h

The teacher starts the lesson by showing the students different items: *a coin, a coil, aluminium foil, a bell,* and asks students what these items have in common. After eliciting the answer *they are made of metal*, the teacher tells the students that the items are in various shapes due to their physical properties, which make them special. In order to understand what these properties are, the teacher shows the students the periodic table and asks the students to name some of the elements that are metals. Then the students listen to "The periodic table song": https://www.youtube.com/watch?v=rz4Dd1I_fX0, which will make them learn more about how to pronounce the elements and to review some of their most important uses. They practise the pronunciation of the chemical elements.

The teacher asks the students to watch a video about the physical properties of the metals https://youtu.be/v8mZsoj_TSc - Metals Part 1: Physical properties, and explains that the pause button will be pressed from time to time to allow the students to write down the necessary information so that they could answer the following questions: *What elements are metals? How do metal atoms bond to each other? How does metallic bonding influence physical properties? What are the main physical properties of metals?*

After watching the video, the teacher divides the students into four groups, each group dealing with one questions. The task is to write a paragraph in which they summarize the information, thus answering the question. In order to better retain the knowledge, all the students are asked to do the interactive exercise: https://learningapps.org/watch?v=pfknjces521.

To check students' understanding on the physical properties of metals which are used in the real world, the teacher shows the students flashcards with metals used in different fields (machinery, cooking utensils, airplanes, buildings, cars, trains, gadgets, water boilers, satellite, medicine) and asks the students to name the specific property for which that metal was used.

As home assignment, the students have to write a paragraph in which they describe a metal, using the specific vocabulary of its properties and use.

Lesson 2 – Is it a metal or a non-metal? – 1 h

The teacher asks students to present their assignment about a metal and its use, according to its properties, after which he/she explains that the lesson will use the knowledge acquired previously to differentiate between metals and non-metals and to compare them based on their physical properties.

The teacher provides the students with two materials and asks them to write three points about the properties of those materials. The students might come up with the materials' applications and physical properties, such as hardness or malleability. In order to enrich students' vocabulary, the teacher asks explains how the properties (nouns) derive from the correspondent adjective through suffixation (*e.g. hard-hardness)*. The students share the answers with the whole class. (If the students are unable to come up with any applications of the same, the teacher should try to elicit responses from them).

Then the teacher shows the students different materials: a piece of coal, iron nails, copper wire, Sulphur powder, a hammer, wires, bulbs, plastic, chalk, and a battery. The students are divided in groups of five and each group is provided with three

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

materials to test and an observation table, containing rubrics for each sample and their properties. Then each group should conduct experiments to test the samples given, for the following properties: *malleability and hardness, conductivity, sonoursness, lustrousness and density.* The teacher must communicate the observables clearly to the students and help and guide them while filling up the observation table. After having tested the materials, the students should be allowed to discuss within their group and come up with a classification for the material. They should be allowed to present their inference to the whole class. Questions should be asked in a manner that will elicit answers from the students.

Assessment FOR learning

- Teacher monitors group, pair and individual activities
- Students communicate their ideas clearly and justify them
- Students interact with a partner (speaking creatively)
- Students participate in all the tasks and activities
- Students do self and peer assessment of the tasks

Assessment OF learning

- Students write a paragraph in which they describe a metal

Material, resources, web tools

Video Lessons

- https://youtu.be/v8mZsoj_TSc - Properties of metals 1: Physical Properties

Reviewed Teaching Resources

- https://learningapps.org/watch?v=pfknjces521

Other Resources

- https://www.youtube.com/watch?v=rz4Dd1I_fX0 - The periodic table song
- https://quizizz.com/admin/quiz/58001bd016bd171f2a2238a0/metals-and-non-metals

Materials

- Multimedia: visual, auditory, digital
- Diagrams
- Concept maps
- Realia: a piece of coal, iron nails, copper wire, Sulphur powder, a hammer, wires, bulbs, plastic, chalk, and a battery

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Project Number: 2019-1-PL01- KA201-065027

Mirror, mirror on the wall

Teacher	Country	School
Mihaela Vatavu Elza Gheorghiu Mihaela Ionescu	Romania	EuroEd Secondary school, Vasile Alecsandri High school

Students' Age	Subject	Topic	Students' target level of competence (CEFR)	Language Skills
16-18	• Math • Physics	Reflection and Refraction	B1 B2	• Listening • Speaking • Reading • Writing • Interaction

Learning objectives (related to curriculum content)

The aim of this learning scenario is to review the students' previous knowledge about reflection, to understand and to demonstrate the law of reflection, and to experiment reflection in plane, convex and concave mirrors.

Learning outcomes

Students will be able to:

- Define reflection
- State the law of reflection
- Describe specular and diffuse reflection
- Describe what happens when light hits a mirror
- Describe why mirrors reflect so well
- Identify properties of image formed by plane mirror
- State the difference between concave mirror and convex mirror

Cognitive skills

- Recognising the components of a picture of reflection of light
- Labelling a picture
- Identifying materials that reflect light
- Define reflection
- Classifying the types of reflection
- Giving examples of specular and diffuse reflection
- Recognise plane, convex and concave mirrors
- Experimenting light reflection in different types of mirrors and drawing conclusions

Language Function

- Clarifying what has been said
- Agreeing or disagreeing
- Instructing
- Analysing

Key language

Co-funded by the Erasmus+ Programme of the European Union

The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Vocabulary:

- Reflection, law of reflection, normal line, incident ray, angle of incidence, reflected ray, angle of reflection, specular reflection, diffuse reflection, light, straight lines, smooth, rough, scattered, image, plane, convex, concave

Verb:

- To reflect, to scatter, to trace

Language structure:

- Relative clauses
- Passive Voice in present
- Comparatives

Activities

Lesson 1 – Reflection and its law-1 h

The teacher starts the lesson about reflection by showing students the following quote by Charles Lindbergh: "I think the light of science is so dazzling that it can be evaluated only by studying its reflection from the . . . mirror of life". Then the teacher asks the students what they previously know about reflection and asks them to fill in their answers on a mind map on the board, providing any corrections if necessary or support questions such as *What is required to create a reflection?/ Which materials are capable of reflecting light?*. Then the teachers announces the topic of the lesson: The reflection of light.

The teacher gives students handouts with graphic representation of the law of reflection https://wordwall.net/resource/19310128/law-reflection and asks the students to watch the video https://youtu.be/zHi6i-QAYj0 - Reflection and Refraction up to min. 3:27. While watching the video, the students have to label the handout (*e.g. normal line, incident line, angle of incidence, angle of reflection)* and write down definitions of *specular reflection* and *diffuse reflection*. After watching the video, the teacher starts a discussion by asking the students the following questions: *What is the law of reflection?/ How do we see objects that do not produce their own light, such as a table or a chair?/ What are the two types of reflection?/ What is specular reflection?/ What are some examples of specular reflection?/ What is diffuse reflection?/ What are some examples of diffuse reflection?* The students do the interactive exercise https://wordwall.net/create/editcontent?guid=c1c511faaf1c447094f3619a25bcb3be.

Lesson 2 – Mirrors and reflection – 1 h

In the beginning of the lesson the teacher shows the students the following picture: https://imgc.artprintimages.com/img/print/man-looking-in-mirror-and-saying-ha-and-in-the-mirror-is-the-reflection-new-yorker-cartoon_u-l-pgtmoe0.jpg?h=550&p=0&w=550&background=fbfbfb and asks the students the following questions: *What do we know about mirrors? What happens when light hits a mirror? Why do they reflect light? Why do they do it so well?*

Then the teacher explains the students that the lesson aims at experimenting what happens with the light when it is reflected in plane mirrors and in concave and convex mirrors. For a better understanding of plane and spherical mirrors, the students watch a video https://www.youtube.com/watch?v=UV49MZvu6Z4 - Ray Tracing for Concave and Convex Mirrors and after watching it the complete the quiz – https://quizizz.com/admin/quiz/5cda3c44105e4d001cb8bc71/concave-and-convex-mirrors. Then the students are divided in three large groups, one of them having to experiment with reflection on a plane mirror, the second with reflection on a concave mirror, and the third with reflection on a convex mirror. The groups that will experiment the reflection on a plane mirror watch the video from the resource https://clil4steam.pixel-online.org/teaching-resources-sch.php?id_asch=127&section_asch=review – Experiment Reflection on a plane mirror and the groups that will experiment the reflection on concave and convex mirrors will watch the video https://www.youtube.com/watch?v=R5A-7K3Rk6M - Concave and Convex Mirror of a Spoon. The students will replicate the experiments they have watched and will fill in a handout with a table in which they will write down all the observations they make on the image of the objects for plane, concave and convex mirrors: https://docs.google.com/forms/d/132pllUunxIci0i_LUubtqPVfnuy2dFAJ21kqeia38Gk/edit (this is an example and teacher can use Google forms to design a similar observation table).

The students present their observations to the class.

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Assessment FOR learning

- Teacher monitors group, pair and individual activities
- Students participate in all tasks and activities
- Students follow the instructions and conduct the experiments
- Students complete information gaps
- Students complete a self-assessment sheet

Assessment OF learning

- Completed handout with observations and presentation

Material, resources, web tools

Video Lessons

- https://youtu.be/zHi6i-QAYj0 - Reflection and refraction

Reviewed Teaching Resources

- https://clil4steam.pixel-online.org/teaching-resources-sch.php?id_asch=127&section_asch=review
- https://wordwall.net/create/editcontent?guid=c1c511faaf1c447094f3619a25bcb3be

Other Resources

- https://imgc.artprintimages.com/img/print/man-looking-in-mirror-and-saying-ha-and-in-the-mirror-is-the-reflection-new-yorker-cartoon_u-l-pgtmoe0.jpg?h=550&p=0&w=550&background=fbfbfb
- https://www.youtube.com/watch?v=UV49MZvu6Z4 - Ray Tracing for Concave and Convex Mirrors
- https://quizizz.com/admin/quiz/5cda3c44105e4d001cb8bc71/concave-and-convex-mirrors
- https://www.youtube.com/watch?v=R5A-7K3Rk6M - Concave and Convex Mirror of a Spoon
- https://wordwall.net/resource/19310128/law-reflection
- https://docs.google.com/forms/d/132pllUunxIci0i_LUubtqPVfnuy2dFAJ21kqeia38Gk/edit

Materials:

- Plane, convex and concave mirrors
- Flashlights
- Paper
- Pencils
- Handouts
- Rulers
- Protractors

Models of the Universe from Geocentric to Heliocentric

Teacher	**Country**	**School**
Annalisa Bassi	Italy	IIS Montale Nuovo IPC

Students' Age	**Subject**	**Topic**	**Students' target level of competence (CEFR)**	**Language Skills**
16-17	• Physics • Math	Models of the Universe from Geocentric to Heliocentric	B1	• Listening • Speaking • Reading • Writing • Interaction

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Learning objectives (related to curriculum content)

The linguistic objectives are to teach students a correct scientific language and to give them the necessary instruments to be able to read and study a scientific article, to be able to watch and understand a video about the planets' orbit.
The specific objectives are

- To be able to frame the scientific findings in a historical contest.
- To know and to understand the gravitational law and the consequences, for example the motion of planets and satellites
- To know, to understand and to explain the three laws of Kepler
- To observe the world around us with curiosity to understand at least in part the technology that we use every day.
- To develop critical thought to be able to see the positive and negative consequences of scientific findings and technological applications.

Learning outcomes

Students will be able to:

- To understand that Physics is a discipline closely linked to other disciplines, in particular History, Philosophy and Science. The development of scientific thought with its subsequent discoveries and applications must be framed in a historical, logical and chronological context.
- To acquire and to interpret information in a critical way through different contexts and through different communicative instruments.
- To estimate scientific credibility of the source and to discern the difference between facts and opinions.
- To communicate and to understand different languages (daily, technical, literary, scientific) and to use them in different contexts..

Cognitive skills

To develop the observation skills and the ability to make connections and suppositions. To be able to be engaged in team work. To acquire and interpret information in a critical way through different contexts and through different communicative instruments.
To estimate the scientific credibility of the source and to discern the difference between facts and opinions.

Language Function

- Classifying
- Comparing
- Describing
- Evaluating and Explaining
- Hypothesizing
- Inquiring/Questioning

Key language

Vocabulary:

- All the vocabulary in the glossary in the video Let's go into Orbit! and in the created resource Orbit

Language structure:

- Present simple and present continuous tense; adverbs of frequency; future tenses (will, present continuous, to be going to); modal verbs for deductions (may, can't, must); If clauses 1st type; imperative form

Activities

Phase 1: Geocentric vs Heliocentric model of the universe and Heliocentric model-Universe today.
Geocentric vs Heliocentric model of the universe
(https://www.youtube.com/watch?v=S13Sr-H7TWI)
Heliocentric And Geocentric Theory | History of the universe | History of Astronomy | Astrophysics
(https://www.youtube.com/watch?v=ZpZ3xY5_4ng)
Models of the Universe [Geocentric to Heliocentric]

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

(https://www.youtube.com/watch?v=UtOEnTiAZlU)
Aristarchus & His Crazy Idea
(https://www.youtube.com/watch?v=RVzaZk1-rRg)
Geocentrism: Why the world doesn't revolve around you | A-Z of ISMs Episode 7 - BBC Ideas
(https://www.youtube.com/watch?v=RsKdoEtZdd8)
Three hours are needed to watch the first 5 videos and to read the article. The teacher presents the videos and comments with the class. Some videos can be used in a flipped classroom approach: the students watch the video at home and then report about it in class. The teacher must enrich the resource with explanations, when needed. As most of the videos are about historical facts and characters, the co-presence of the philosophy teacher could be even more useful and interesting, as they might further enrich the topic with historical, social and political information about the time and place when these scientists lived and about their life.

Phase 2: Heliocentric model-Universe today
(https://www.universetoday.com/33113/heliocentric-model/)
The students read the article for homework; they can be asked to draw comparative charts with the information they read about and to look for other material to amplify the historical knowledge about this topic. Then, working in groups, the students present their work to the class.

Phase 3: Explained In 5 Questions: Kepler's Law of Planetary Motion | Encyclopaedia Britannica.
An hour is needed to watch the video and to add the explanation of the topic. The second hour is dedicated to the introduction of the conic sections. The students already know about the circle and the parabola and this is the moment to start with the mathematical study of the ellipse. The teacher must point out the connection between the equation and the graph and the importance of eccentricity. This resource is useful to introduce the conic section in Maths

Assessment FOR learning

The students are very active: they are asked to look for similar information on the web and to report about it to the class. So they need to focus on the three key-questions of "Assessment for learning": What do I know? What do I want to learn? What have I learnt? The production of a Portfolio or an Oral Presentation could be useful to achieve awareness of the student's learning process.

Assessment OF learning

Assessment of learning will be achieved at the end of the phases, after the students have been involved in their research. It will test the content of the learning module: Heliocentric And Geocentric Theory with particular reference to the historical context and about the ellipse. Part of the final grade will test the use of the correct language structures (present simple and present continuous tense; adverbs of frequency; future tenses (will, present continuous, to be going to); modal verbs for deductions (may, can't, must); If clauses 1st type; imperative form). A short essay or report could be used for this purpose as it will allow the teacher to test both the content and the language.

Material, resources, web tools

Video lesson

- https://www.youtube.com/watch?v=APIIX6HUVI8&ab_channel=CLIL4SteamProject

Reviewed teaching resources

- https://clil4steam.pixel-online.org/tr_created-sch.php?id_asch=92&section_asch=creation

Reviewed teaching resources

- https://www.youtube.com/watch?v=S13Sr-H7TWI
- https://www.universetoday.com/33113/heliocentric-model/
- https://www.youtube.com/watch?v=ZpZ3xY5_4ng
- https://www.youtube.com/watch?v=UtOEnTiAZlU
- https://www.youtube.com/watch?v=RVzaZk1-rRg
- https://www.youtube.com/watch?v=RsKdoEtZdd8
- https://www.youtube.com/watch?v=AKbfR5KHUm4

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

CLIL for STEAM
Project Number: 2019-1-PL01- KA201-065027

My bean seed has come to life

Teacher	Country	School
Vatavu Mihaela Gabriela Pascal	Romania	EuroEd Secondary School

Students' Age	Subject	Topic	Students' target level of competence (CEFR)	Language Skills
11-12	• Biology	Photosynthesis	A2 B1	• Listening • Speaking • Reading • Writing • Interaction

Learning objectives (related to curriculum content)

The aim of this learning scenario is to recognize/identify and understand the life cycle of a bean plant by using the scientific method of observing and documenting the changes of the plant over time, and to use this knowledge to predict the life cycle of other plants.

Learning outcomes

Students will be able to:

- To define plant life cycle vocabulary words
- To list what plants need to grow
- To draw out a plant lifecycle
- To explain the function of each plant part
- To grow their own plants
- To write a diary about the growth of their own plant

Cognitive skills

- Describing parts of the plant
- Classifying according to categories
- Understanding the life cycle of a plant
- Ordering the stages of the life cycle of a plant in a logical sequence
- Writing notes to record the changes observed in a growing bean plant
- Predicting the life cycle of other plants
- Comparing the results and drawing conclusions
- Finding patterns, noticing differences and similarities in life cycles of different plants

Language Function

- Describing
- Observing
- Sequencing
- Predicting
- Reporting
- Comparing
- Concluding
- Generating hypothesis on causes & effects

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Key language

Vocabulary:

Flower, leaves, roots, stem, plant, petal, seed, flower bud, pod, shoot, soil, ground, life cycle, sunlight, photosynthesis, chlorophyll, carbon dioxide, oxygen, sunlight, environment, fertilizer, trunk

Verb:

- Germinate, make a hole, drop a seed, pour water

Language structure:

- Sequencing: first, next, last
- Making comparisons
- Expressing predictions
- Stating conclusions

Activities

Lesson 1 –The main parts of a plant - 1 h

Teacher brings a plant to class (house or garden plant, depending on the season) and shows it to the students asking them: *Do you know what plant it is? What are the main parts of a plant?*

Then the teacher asks the students to check their answers by labelling a picture of a bean plant in a Wordwall exercise (https://wordwall.net/resource/17287646/parts-bean-plant). The picture must include the words *seed, roots, stem, leaves, and flowers.*

Showing the different parts of the plant the teacher elicits their names in L1. The teachers points to the parts of the plant and drills their English names. Then the teacher shows the students flashcards with parts of different plants and asks students to recognize and name them, thus reinforcing the vocabulary.

Teacher asks students: *What does a plant need to grow and survive?*

The teacher gives students a worksheet with a gapped text and asks students to fill in the words related to what plants need to grow by watching the video about Photosynthesis https://youtu.be/XIgI8r9z5WQ - Photosynthesis, then checks the answers.

Teacher uses literature to provide a new insight into the topic, by asking the students to watch the video *Jack and the Beanstalk* and answer some comprehension questions (handout); at the end of the film – discussions: the teacher collects observations and monitors students sharing prior knowledge and exploring existing ideas and concepts about plants growth.

Lesson 2- The life cycle of a plant (the stages of plant growth) - 1 h

Teacher shows students a picture representing the leaves of a bean plant and elicits the name of the plant and the part it is shown in the picture. Then the teacher presents the picture of the whole bean plant and asks the students to name each part. After that the teacher asks the students to watch the video https://www.youtube.com/watch?v=w77zPAtVTuI -Bean Time-Lapse, giving further explanations on what they see (emphasizing mostly on the germination process). Students are given pictures representing the stages of a bean plant life cycle and are asked to put them in order, according to what they have observed in the video. The teacher then draws a complete bean plant life cycle (with no words written, only with numbered stages) on the board and explains why it has the shape of a circle. The students are then given worksheets with a drawing of the bean plant life cycle and sentences explaining the stages and are asked to match the caption with the stage in the picture. Then, using the sequencing vocabulary, they will have to present the bean plant life cycle (e.g. *First the bean seed is planted in the soil. Then, the seed starts to germinate. After that…)*. Then students work in pairs to ask and answer questions like *What is the first to grow, the shoot or the root? What grows last, the see pod or the flowers?*

Lesson 3 - Taking care of your own plant (Growing your own plant) -1 h

Teacher presents students a pot with a grown bean plant and asks them if they think they could grow a plant on their own. Then while watching the video https://www.youtube.com/watch?v=zEOfdGaO5r8 - THE BEAN PLANT EXPERIMENT, the students will have to work in pairs and write down all the materials they saw they would need to conduct the experiment (*transparent plastic glass, cotton, water etc.*). Teacher divides the students into four groups and gives each group a recipient containing a bean plant in different stages of growth. Then s/he asks the students to observe the sample and name the stage of their plant's life cycle. The students will work collaboratively and place the recipients on a table in the correct order, according to the life cycle stage. Then the teacher explains to them that each of them will have to grow a bean plant,

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

following the directions they saw in the video and the observations they made in class. Furthermore, for seven days they will have to keep a diary consisting of a table with three rubrics: *Question/Prediction/ Observation.* While in class, the teacher gives the students the printed diaries containing the table and the questions they will have to answer to (*e.g. In what day will the seed start to germinate? In what day will the root start to grow?)*. The students will use Future Simple and ordinal numbers to write their predictions. The experiment and the completion of the Observation rubric in their diaries is an assignment for the next class. The directions for the experiment protocol and the diary can be found here: https://www.bookwidgets.com/play/ppunmdu0-iQAEQ8VjfAAAA/DCLXNDN/life-cycle-of-a?teacher_id=6176736076103680

L4- Reflections on the plant development– 1 h
The students will have to present the pots with their plants and the completed diaries. Then, in pairs they will measure the plants and their parts and will make comparisons, using also the entries in their diaries (*e.g. My bean seed germinated faster/slower than yours. My plant stem is taller/shorter than yours.).* After that, in groups, they will write a short story about their experiment and present it in front of the class.

Then the teacher shows students pictures of an apple tree, a sunflower and a radish and asks students if they think their life cycle is the same as for the bean plant. Students will have to find similarities and differences for these three plants (similarities: *you put seeds in the soil, the seeds germinate, the roots grow deep in the ground /*differences: *the stem of a tree is called trunk, the radish is the root bulb of the plant etc.*).

Assessment FOR learning

- Observational assessment
- Peer assessment
- Self-assessment
- Quiz (Wordwall, Quizzes)

Assessment OF learning

- Presentation of the experiment
- Written report/ diary

Material, resources, web tools

Video Lessons

- https://youtu.be/XIgl8r9z5WQ - Photosynthesis

Other Resources

- https://wordwall.net/resource/17287646/parts-bean-plant
- https://www.youtube.com/watch?v=w77zPAtVTuI - Bean Time-Lapse
- https://www.youtube.com/watch?v=zEOfdGaO5r8 - THE BEAN PLANT EXPERIMENT
- https://www.bookwidgets.com/play/ppunmdu0-iQAEQ8VjfAAAA/DCLXNDN/life-cycle-of-a?teacher_id=6176736076103680

Materials

- Cycle diagrams
- Tables
- Pictures
- Realia: plants
- Conceptual map
- Questionnaires

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Project Number: 2019-1-PL01- KA201-065027

My nutrient superhero: protein

Teacher	Country	School
Elza Gheorghiu Marieta Condrea	Romania	EuroEd Secondary School, Vasile Alecsandri High School

Students' Age	Subject	Topic	Students' target level of competence (CEFR)	Language Skills
16-18	• Biology • Chemistry	Proteins - compounds in food	B1 B2	• Listening • Speaking • Reading • Writing • Interaction

Learning objectives (related to curriculum content)

The aim of this learning scenario is to help students understand the importance of proteins and the variety of functions and roles they play in cells and organisms.

Learning outcomes

Students will be able to:

- Classify proteins
- Identify the importance of amino acids
- Differentiate between nonessential and essential amino acids
- Explain how proteins are rated based on their quality
- Compare complete and incomplete protein sources
- Describe how proteins can be considered complementary
- Ask and answer question about proteins
- Describe what a protein is
- Identify foods with protein
- Explain how and why to eat protein

Cognitive skills

- Identifying macronutrients in food
- Matching words to their definitions
- Translating the most difficult vocabulary into their mother tongue
- Predicting the meaning of the terms
- Identifying proteins and their sources
- Calculating the amount of proteins in different foods
- Giving opinions about the role of proteins in our bodies
- Rating the foods according to the amount of proteins

Language Function

- Identifying items
- Asking questions
- Agreeing or disagreeing
- Drawing conclusions
- Formulating opinions

Co-funded by the Erasmus+ Programme of the European Union

The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Project Number: 2019-1-PL01- KA201-065027

Key language

Vocabulary:

- Proteins, amino acids, peptides, polypeptides, carboxylic, nitrogen, enzyme, hormone, antibody, essential, non-essential, intake, complete proteins, incomplete proteins

Verb:

- Grow, maintain, repair, replace, ingest

Language structure:

- Present Simple Active and Passive
- Infinitive of purpose
- Comparatives
- Countable and uncountable nouns
- Linking words

Activities

Lesson 1 – What are proteins? 1h

Teachers introduces the topic by showing the students several pictures of food rich in animal protein, preferably from different traditional cuisines, for the multiculturalism purpose, and asks the students what they have in common. After eliciting the answer, 'protein', the teacher asks the students to think of other macronutrients we can find in food. Then the teacher explains the students that protein are some of the most complex biological macromolecules, because they are in charge with a wide variety of functions in our body. For a better understanding of what proteins are, how they are formed, and how they are classified, the teacher asks the students to watch the video: https://youtu.be/eux5gRCxQ98 - Proteins-compounds in food, up to minute 5:48, and while watching it, to select the correct answers on the following worksheet: https://wordwall.net/print/18132583/proteins. Since the presentation contains difficult names of chemical compounds, the teacher will divide the students in groups of four and will give them flashcards with the specific terms and their definitions and ask them to work collaboratively to match the term with the definition. Then, in turns, a student from a group reads the term, and a student from a different group will read the matching definition. In this way they will do a peer-assessment of the task. In order to expand the understanding of the technical vocabulary, students will work individually on the interactive exercise: https://wordwall.net/resource/9624903/protein-word-puzzle.

Lesson 2 – My favourite protein – 1h

In the beginning of the lesson the teacher presents the students Quizlet flashcards https://quizlet.com/_9yria5?x=1qqt&i=3r8qvd, containing information about proteins from the previous lesson but also some new questions, and asks students to make assumptions on the correct answers.

In order for the students to see how important proteins are for our health and what happens when we eat proteins, they watch the video https://www.youtube.com/watch?v=HSCUAjZQhXI – Proteins, from minute 2:29. The video gives explanation on what happens with the protein in our bodies, but most importantly, it offers insight on the sources of proteins and the daily requirements of protein for healthy adults. The students are given a chart containing three rubrics: *food containing proteins, source, and gram/serving*. While watching the video, the students must complete the chart by listing as many foods containing protein from the video as they can, and identify the source of the food, such as animal or plant (beef, pork, poultry, eggs, beans, nuts etc.). Then the teacher divides them into groups of four and asks the students to work collaboratively to find out more foods containing protein. The minimum number of foods containing protein is set by the teacher. Then, using mobile phones, the students will have to use nutritional value charts and research the grams of protein per serving of each of the foods listed.

After finishing the chart, the students will have to answer the following questions: *Which food is one of the best sources of high-quality protein? Which food has the least amount of protein? Name a food other than a meat which is high in protein. What foods can you eat that will give you the most protein for each serving? Do you think you're getting enough protein in your diet? What foods do you eat that have a lot of protein? Which do not?*

Co-funded by the Erasmus+ Programme of the European Union

The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Assessment FOR learning

- Teacher monitors group, pair and individual activities
- Students successfully play the matching games
- Students interact with their peers to find out information
- Students participate in all tasks and activities
- Students complete information gaps

Assessment OF learning

- Students present their completed information chart

Material, resources, web tools

Video Lessons

- https://youtu.be/eux5gRCxQ98 - Proteins- compounds in food

Reviewed Teaching Resources

- https://clil4steam.pixel-online.org/teaching-resources-sch.php?id_asch=69&section_asch=creation

Reviewed Teaching Resources

- https://clil4steam.pixel-online.org/teaching-resources-sch.php?id_asch=82&section_asch=review
- https://clil4steam.pixel-online.org/teaching-resources-sch.php?id_asch=45&section_asch=review

Other Resources

- https://wordwall.net/print/18132583/proteins
- https://quizlet.com/_9yria5?x=1qqt&i=3r8qvd

Materials

- Multimedia: visual, auditory, digital
- Handouts
- Flashcards

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

CLIL for STEAM
Project Number: 2019-1-PL01- KA201-065027

Optical phenomenon - mirage

Teacher	Country	School
Marcin Paśnikowski Agata Ziętek	Poland	Szkoła Podstawowa nr 5 im. Janusza Kusocińskiego w Świdniku

Students' Age	Subject	Topic	Students' target level of competence (CEFR)	Language Skills
13-15	• Physics	Mirage phenomenon	A2 B1	• Listening • Speaking • Reading • Writing • Interaction

Learning objectives (related to curriculum content)

Students will be able to:

- Describe the conditions necessary for the occurrence of the mirage phenomenon,
- Distinguish between types of mirages
- Describe the meaning of these phenomena in everyday life
- Observe this phenomenon in everyday situations

Learning outcomes

Students will be able to observe the discussed phenomenon, explain the conditions of its formation.

Cognitive skills

Students will develop self-motivation, problem-solving skills, independent learning and observation of phenomena in human life. They will improve their persistent, selective, divided attention as well as logic and reasoning.

Language Function

Students will be able to explain the phenomenon of light refraction in various centers and its practical application. Students will learn to hypothesize, describe, analyze, summarize and draw conclusions, and observe various phenomena

Key language

Vocabulary:

- Light, refraction, light reflection, refraction, refractive index, upper and lower mirage.

Verb:

- Solve, define, experiment, prove, apply, observe, define, draw.

Language structure:

- Present simple; basic English vocabulary with a combination of physical and technical terms

Activities

37) Introduction of the topic and vocabulary related to the topic.
38) 2. Demonstration of a video lesson.
39) 3. The film is paused several times so that students have time to reflect, ask questions, participate in discussions.
40) 4. While watching the movie, students are encouraged to write down the words they want to learn.

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

41) 5. Working in small groups, students compare their notes and explain the meanings of words and phenomena to each other.
42) 6. The teacher monitors the students' work and provides the necessary support when needed.
43) 7. Working with a text in coursebook describing the mirage phenomenon and answering the questions asked.
44) 8. The teacher asks the students to reflect on what they have learned in the lesson and sums up the lesson.
45) 9. If there are favorable conditions, students and the teacher go out and try to observe the phenomenon of a mirage over the hot streets.
46) 10. Students work in groups to prepare posters/interactive presentations to show the phenomenon of a mirage. They include key vocabulary into their presentations. After they have finished their work, they present it to the rest of the class.

Assessment FOR learning

The teacher will thus ask students questions and provide feedback, helping students understand what it is like to be successful in each assignment (e.g., hypothesizing from experience, solving theoretical problems).

Assessment OF learning

Students will be assessed at the end of the unit by taking a test.

Material, resources, web tools

Video Lessons

- https://clil4steam.pixel-online.org/video-library-sch.php?id_asch=29

Other Resources

- https://www.youtube.com/watch?v=maLRhoceeuc
- https://astronomy.com/magazine/stephen-omeara/2014/05/the-bewitching-fata-morgana
- https://learningapps.org/watch?v=p0ehcvwq221
- https://www.eoas.ubc.ca/courses/atsc113/sailing/met_concepts/10-met-local-conditions/10f-optical-phenomena/
- https://www.skybrary.aero/index.php/Fata_Morgana
- https://wordwall.net/resource/3206953/tricks-light-unscramble-12-words

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

CLIL for STEAM
Project Number: 2019-1-PL01- KA201-065027

Optical phenomenon - rainbow

Teacher	Country	School
Marcin Paśnikowski Agata Ziętek	Poland	Szkoła Podstawowa nr 5 im. Janusza Kusocińskiego w Świdniku

Students' Age	Subject	Topic	Students' target level of competence (CEFR)	Language Skills
13-15	• Physics	conditions for the formation of a rainbow	A2 B1	• Listening • Speaking • Reading • Writing • Interaction

Learning objectives (related to curriculum content)

Students will be able to:

- Enumerate the colours of the rainbow
- List these colours in the sequence
- Conduct and discuss experiments showing the formation of a rainbow
- Know the types of rainbows

Learning outcomes

Students will be able to analyze the way white light behaves and characterize the rainbow phenomenon

Cognitive skills

Students will develop self-motivation, problem-solving skills, independent learning and observation of phenomena in human life. They will improve their persistent, selective, divided attention as well as logic and reasoning.

Language Function

Students will be able to explain the phenomenon of light refraction and its practical application. Students will learn to hypothesize, describe, analyze, summarize and draw conclusions, and observe the phenomena connected with the rainbow.

Key language

Vocabulary:

- Light, refraction, light reflection, refraction, colours, refractive index, analysis, spectrum.

Verb:

- Solve, define, experiment, prove, apply, observe, define, draw

Language structure:

- Present simple; basic English vocabulary with a combination of physical and technical terms.

Activities

47) Introduction of the topic and vocabulary related to the topic.
48) The teacher performs an experiment showing the splitting of white light.
49) Demonstration of a video lesson.
50) The film is paused several times so that students have time to reflect, ask questions, participate in discussions.
51) While viewing the video, students are encouraged to write down the words they want to learn.

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

52) Working in small groups, students compare their notes and explain the meanings of words and phenomena to each other.
53) The teacher monitors the students' work and provides the necessary support when needed.
54) Students work in pairs and try to create a rainbow using prisms.
55) The teacher asks students to reflect on what they have learned in the lesson and summarizes the lesson.
56) The teacher checks their knowledge using a theory test.
57) The teacher gives students homework to create a Newton disc at home (colours of the rainbow and white light)

Assessment FOR learning

The teacher will thus ask students questions and provide feedback, helping students understand what it is like to be successful in each assignment (for example, making a hypothesis from experience, solving theoretical problems).

Assessment OF learning

Students will be assessed at the end of the unit by passing a test and completing tasks showing an understanding of the properties of white light.

Material, resources, web tools

Video Lessons

- https://clil4steam.pixel-online.org/video-library-sch.php?id_asch=28
- https://www.youtube.com/watch?v=HLChkxfSUhI
- https://www.youtube.com/watch?v=xkDhQGXqwCM
- https://www.youtube.com/watch?v=abz5gRwZptU
- https://www.youtube.com/watch?v=vXccpwytjL8
- https://www.youtube.com/watch?v=rGV4XzPYc2Y

Other Recources

- https://wordwall.net/resource/3206953/tricks-light-unscramble-12-words

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

CLIL for STEAM
Project Number: 2019-1-PL01- KA201-065027

Our solar system

Teacher	Country	School
Elza Gheorghiu Ioan Juncu Vlad Orza Marius Patras	Romania	EuroEd Secondary school

Students' Age	Subject	Topic	Students' target level of competence (CEFR)	Language Skills
14-16	• Physics • Technology • Arts	Let's go in to orbit!	B1	• Listening • Speaking • Reading • Writing • Interaction

Learning objectives (related to curriculum content)

The aim of this learning scenario is to learn about our Solar System, its discovery and exploration, the laws that rule the planetary motion, the 8 planets, and to make a model of the solar system.

Learning outcomes

Students will be able to:

- Learn about the discovery and exploration of the solar system
- Understand Kepler's Laws of planetary motion
- Describe the planetary bodies that comprise our solar system
- Name the planets of our solar system in the correct order from the sun
- Name the terrestrial and the Jovian planets
- Demonstrate an understanding of the solar system
- Differentiate between stars, moons and planets
- Define key terms
- Design a model of the solar system

Cognitive skills

- Stating facts related to the discovery and exploration of the solar system
- Describing Kepler's laws
- Matching the key words to their definitions
- Drawing a mind map
- Classifying the planets according to different criteria
- Carrying out an experiment
- Analysing and interpreting the results of an experiment

Language Function

- Identifying
- Analysing
- Comparing and contrasting
- Hypothesising
- Interpreting

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Project Number: 2019-1-PL01- KA201-065027

Key language

Vocabulary:

- Solar system, asteroid, comet, meteoroid, sun, moon, terrestrial planets, Jovian planets, binary system, star, Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune, gravitational field, terrestrial planets

Verb:

- To orbit, to move

Language structure:

- Passive voice in the present
- Adjectives and comparatives

Activities

Lesson 1 – The Solar System and the theories about it – 1 h

The teacher starts the lesson with a discussion about planets and our solar system by asking the students to share with the class as much information as possible. Then the teacher shows the pictures of Aristotle, Copernicus, and Galileo and asks the students if they know who those famous people were and why they are linked to the topic of the lesson. The students make assumptions and the teacher gives the students a worksheet containing scrambled paragraphs about the discovery and exploration of the solar system and asks the students to put them in chronological order while watching the video https://youtu.be/APIIX6HUVI8 - Let's go into orbit – from minute 1:35 to minute 3:48, and then the video https://youtu.be/KryBLz97NXw - Historical approach to Solar System models. Then the teacher pairs up the students and gives each pair a table containing key words about orbits, asking the students to watch the full video https://youtu.be/APIIX6HUVI8 - Let's go into orbit again and write down the definitions of the key words. After finishing the task, the teacher gives the students the following assignment (flipped classroom): to watch the video https://www.youtube.com/watch?v=AKbfR5KHUm4 - Kepler's Laws of Planetary motion at home, and to work the interactive exercise https://www.liveworksheets.com/nz1893591ip.

Lesson 2 – Our Solar System – 1 h

In the beginning of the lesson the teacher checks the assignment and gives further clarifications. Then, the students, with their teacher's support, will make a mind map for Kepler's laws.

The teacher tells the students that they will be learning about the solar system in which they live, and elicits the knowledge they previous have, such as the number of planets in our solar system and their names. Then teacher asks the students to watch the video https://www.youtube.com/watch?v=libKVRa01L8 - Solar System 101 | National Geographic, and pauses it from time to time to allow students to copy key words and define them. After that, the teacher divides students in groups of four and gives them the transcript of the video. Each group will represent either the terrestrial planets or the Jovian ones, and the four members of each group will represent a planet from these categories. The task is to read the text (and watch the video within groups, if possible) and find the characteristics for each category of planets and the specific of each planet. After finishing the task, a student from each group presents their results in front of the class without naming the planet and the other students have to name the planet, according to the information they got from the text and the video.

Lesson 3 – Pocket Solar system – 1 h

For a better understanding of the solar system, the teacher explains to the students that they will be able to analyse and interpret data to determine scale properties of objects in the solar system, to describe the relative distances between the orbits of the planets and to recognize that objects in the solar system are very far from each other. For this purpose the teacher divides the students into four group and provides each group with the following materials: pre-cut strips of register tape (one meter per student), round stickers (5 large & 5 small per group) and pencils. The teacher also has a finished model to show the students. The indications on how to do the models of the solar system are presented in the following resource: https://clil4steam.pixel-online.org/teaching-resources-sch.php?id_asch=190&section_asch=review. After finishing the task, there will be a moment of reflection on the insights the students got from building this model.

Assessment FOR learning

- Teacher monitors group, pair and individual activities

Co-funded by the Erasmus+ Programme of the European Union

The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

- Students participate in all tasks and activities
- Students successfully play matching games
- Students interact with a partner (speaking creatively)
- Students complete a self-assessment sheet
- Students work autonomously to make a model

Assessment OF learning

- Model of the solar system

Material, resources, web tools

Video Lessons

- https://youtu.be/APIIX6HUVI8- Let's go into orbit
- https://youtu.be/9blaY6W41dg - Force of gravity

Created Teaching Resources

- https://clil4steam.pixel-online.org/teaching-resources-sch.php?id_asch=63&section_asch=creation

Lesson Plan

- https://clil4steam.pixel-online.org/lesson-plans-sch.php?id_asch=9

Other Resources

- https://www.youtube.com/watch?v=AKbfR5KHUm4 - Kepler's Laws of Planetary motion
- https://youtu.be/KryBLz97NXw - Historical approach to Solar System models
- https://www.liveworksheets.com/nz1893591ip
- https://www.youtube.com/watch?v=libKVRa01L8 - Solar System 101 | National Geographic

Materials:

- Student notebooks
- Projector
- Computer with internet
- Paper
- Pre-cut strips of register tape, round stickers and pencils

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

CLIL for STEAM
Project Number: 2019-1-PL01- KA201-065027

Percentages in real life (1)

Teacher	Country	School
Aneta Seremak	Poland	Szkoła Podstawowa nr 5 im. Janusza Kusocińskiego w Świdniku

Students' Age	Subject	Topic	Students' target level of competence (CEFR)	Language Skills
13-14	• Math	Percentages	B1 B2	• Listening • Speaking • Reading • Writing • Interaction

Learning objectives (related to curriculum content)

Upon completion of this lesson, students should be able to:

- Explain what a percentage is
- Apply percentage calculations
- Know key vocabulary in English

Learning outcomes

Students will be able to use percentages to solve real life examples.
Students will acquire the basic English vocabulary related to percent.

Cognitive skills

Students will understand and be able to apply percentage calculations. They will be able to define what the percent is. They will improve their sustained, selective, divided attention, long term memory, logic, and reasoning

Language Function

Students will be able to explain what percentage is.
Students will learn to describe, analyze, summarize and draw conclusions.

Key language

Vocabulary:

- Percentages, per cent, one hundredth, fractions, decimals, fractional parts.

Verb:

- Divide, represent, measure, quantify, reduce, define.

Language structure:

Present simple tense and past simple, conditional sentences, modal verbs, future simple

Activities

58) Introducing the topic and the key vocabulary.
59) Demonstrating the video lesson, when the teacher wants to ask questions and give explanation to the content the video is paused.

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

60) Students are provided some time to work individually with the glossary to improve their reading skills and practice new vocabulary.
61) Teacher gives learners words or phrases which are associated with the glossary term and requires them to use them in other sentences.
62) Teacher makes sure that students understand the content by giving them problems selected from slides. The teacher presents the slides and makes pauses in certain moments to give students opportunity to make notes, asks questions and develops some presented problems. The teacher should give them a feedback and show students more examples on the black table. Students should do similar exercises in pairs.
63) Demonstration of the Shopping and Percentage teaching resource and working in groups of three.
64) Students do the dictionary with new words presented during the lesson.
65) The teacher asks students to reflect on what they have learned and summarizes the lesson.
66) As a homework teacher can ask students to answer the questions in English:
67) "What is the percent?", "Do you know the symbol of the percent?" "How to change fraction into decimal?", "How to change percent into fraction?" , "How to change percent into decimal?" "How to calculate fraction of quantity?", "How to calculate 50% of quantity?".

Assessment FOR learning

At the end of the classes the teacher questions the students, observes the students' work, the and provides the feedback and gives support.

Assessment OF learning

Students fill the test.

Material, resources, web tools

Video Lessons

- https://clil4steam.pixel-online.org/video-library-sch.php?id_asch=14

Created Teaching Resources

- https://clil4steam.pixel-online.org/teaching-resources-sch.php?id_asch=84&section_asch=creation
- https://clil4steam.pixel-online.org/teaching-resources-sch.php?id_asch=39&section_asch=creation

Reviewed Teaching Resources

- https://clil4steam.pixel-online.org/teaching-resources-sch.php?id_asch=154&section_asch=review

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

CLIL for STEAM
Project Number: 2019-1-PL01- KA201-065027

Percentages in real life (2)

Teacher	Country	School
Dovilė Žigienė	Lithuania	Trakų Vytauto Didžiojo gimnazija

Students' Age	Subject	Topic	Students' target level of competence (CEFR)	Language Skills
13-14	• Physics	Percentages	B1 B2	• Listening • Speaking • Reading • Writing • Interaction

Learning objectives (related to curriculum content)

This learning scenario aims to explain what a percentage is, explain how to apply percentage calculations in real life situations, and introduce topic-related vocabulary in English.

Learning outcomes

Students will be able to:

- Explain what a percentage is;
- Convert percent to a fraction;
- Calculate a percentage of an amount;
- Apply percentage calculations in real life situations.
- Use key vocabulary in English effectively when discussing the content of the lesson.

Cognitive skills

Students will develop positive learning habits, self-motivation, problem solving, self-directed and independent learning skills.

Language Function

In this lesson, students will use the language to define, explain, discuss and compare.

Key language

Vocabulary:

- Percentages, per cent, one hundredth, fractions, decimals, fractions, fractional parts, portion, proportion, quantity, numerator, denominator, classified into parts, interest rates, discount rates, increase, decrease.

Verb:

- Divide, represent, classify, measure, shaded, apply, multiply, to be equal, reduce, calculate, increase

Language structure:

- Present simple tense, conditional sentences.

Activities

23. Introducing the topic and topic-related vocabulary.
24. Demonstrating the video lesson.
25. The video is paused several times so that students have some time to think, ask questions, participate in the discussion.
26. During the review of the video the students are encouraged to write down the words that they want to learn.
27. The teacher distributes copies of the worksheets to students with information and questions about percentages.

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

28. Working individually, students revise the topic and get ready to answer the questions.
29. The teacher asks students to answer the questions, helps students who have difficulties speaking English.
30. The teacher distributes copies of worksheet 1 on Percentages. Students make calculations and, working in pairs, compare them with their partners.
31. The teacher monitors the students' work and provides the necessary support when needed.
32. The teacher asks students to reflect on what they have learned in the lesson and summarizes the lesson

Assessment FOR learning

The teacher will question the students and provide feedback in this way, helping the students to understand what the successful work looks like in each task (for example, explaining what a percentage is, calculating a percentage of the amount).

Assessment OF learning

Students will be assessed at the end of the unit by completing an equation solution test

Material, resources, web tools

Video lesson

- https://clil4steam.pixel-online.org/video-library-sch.php?id_asch=14

Created teaching resources

- https://clil4steam.pixel-online.org/tr_created-sch.php?id_asch=18&section_asch=creation
- https://clil4steam.pixel-online.org/tr_created-sch.php?id_asch=40&section_asch=creation
- https://clil4steam.pixel-online.org/tr_created-sch.php?id_asch=39&section_asch=creation
- https://clil4steam.pixel-online.org/tr_created-sch.php?id_asch=50&section_asch=creation
- https://clil4steam.pixel-online.org/tr_created-sch.php?id_asch=86&section_asch=creation

Reviewed teaching resources

- https://clil4steam.pixel-online.org/tr_reviewed-sch.php?id_asch=49&section_asch=review
- https://clil4steam.pixel-online.org/tr_reviewed-sch.php?id_asch=50&section_asch=review
- https://clil4steam.pixel-online.org/tr_reviewed-sch.php?id_asch=104&section_asch=review
- https://clil4steam.pixel-online.org/tr_reviewed-sch.php?id_asch=136&section_asch=review
- https://clil4steam.pixel-online.org/tr_reviewed-sch.php?id_asch=137&section_asch=review
- https://clil4steam.pixel-online.org/tr_reviewed-sch.php?id_asch=147&section_asch=review
- https://clil4steam.pixel-online.org/tr_reviewed-sch.php?id_asch=154&section_asch=review
- https://clil4steam.pixel-online.org/tr_reviewed-sch.php?id_asch=182&section_asch=review

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Project Number: 2019-1-PL01- KA201-065027

Phenomena in the lenses

Teacher	Country	School
Marcin Paśnikowski Agata Ziętek	Poland	Szkoła Podstawowa nr 5 im. Janusza Kusocińskiego w Świdniku

Students' Age	Subject	Topic	Students' target level of competence (CEFR)	Language Skills
13-15	• Physics	Optics	A2 B1	• Listening • Speaking • Reading • Writing • Interaction

Learning objectives (related to curriculum content)

Upon completion of this lesson, students should be able to:

- Define the law of refraction in lenses
- Describe the course of rays parallel to the optical axis passing through the converging and scattering lens,
- Constructively draw images produced by the lenses;
- Distinguish between real, apparent, straight and inverted images;
- Use the concept of myopia and farsightedness and describe the role of lenses in correcting these visual defects;
- Learn the key vocabulary of the English language

Learning outcomes

Students will be able to apply the law of light refraction in the experiment and in the phenomena of obtaining images in lenses. They will also be able to explain and describe the process in English.

Cognitive skills

Students will develop self-motivation, problem-solving skills, independent learning and observation of phenomena in human life. They will improve their persistent, selective, divided attention, long-term memory, logic and reasoning.

Language Function

Students will be able to explain the phenomenon of light refraction and its application in practice. Students will learn to hypothesize, describe, analyze, summarize, and draw conclusions

Key language

Vocabulary:

- Lens, refraction, light reflection, shadow image, real image, focal length, lens focus, normal, incident ray, reflected and refracted ray, refractive index.

Verb:

- Solve, define, experiment, prove, apply, define, draw.

Language structure:

- Present simple; basic English vocabulary with a combination of physical and technical terms.

Co-funded by the Erasmus+ Programme of the European Union

The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Activities

68) Introduction of the topic and vocabulary related to the topic.
69) Demonstration of a video lesson.
70) The film is paused several times so that the students have time to think, ask questions, participate in the discussion.
71) In reviewing the video, students are encouraged to write down the words they want to learn.
72) Demonstration of an experiment on obtaining images in lenses and methods of correcting vision defects.
73) Working individually, students apply the law of light refraction in the lenses and determine the parameters of the resulting images.
74) Working in small groups, students compare and explain their solutions.
75) The teacher monitors the students' work and provides the necessary support when needed.
76) The teacher asks students to reflect on what they have learned in the lesson and summarizes the lesson.
77) The teacher gives homework to practice calculating the parameters and images using the pages of the project.

Assessment FOR learning

The teacher will ask students questions and give feedback in this way, helping students understand what a successful job looks like in each assignment (for example, making a hypothesis in experience, solving accounting problems).

Assessment OF learning

Students will be assessed at the end of the unit by completing a test and calculation tasks

Material, resources, web tools

Video Lessons

- https://clil4steam.pixel-online.org/video-library-sch.php?id_asch=10

Other Resources

- https://www.physicsclassroom.com/Physics-Interactives/Refraction-and-Lenses/Optics-Bench/Optics-Bench-Refraction-Interactive
- https://www.vascak.cz/data/android/physicsatschool/template.php?s=opt_dioptrie&l=cz
- https://www.vascak.cz/data/android/physicsatschool/template.php?s=opt_spojka&l=cz
- https://www.vascak.cz/data/android/physicsatschool/template.php?s=opt_rozptylka&l=cz
- https://ophysics.com/l13.html

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Project Number: 2019-1-PL01- KA201-065027

Physical and Chemical Properties of Metals

Teacher	Country	School
Rima Vaišnorienė	Lithuania	Panevėžio Kazimiero Paltaroko gimnazija

Students' Age	Subject	Topic	Students' target level of competence (CEFR)	Language Skills
14-16	• Chemistry • Physics	Metals	B2	• Listening • Speaking • Reading • Writing • Interaction

Learning objectives (related to curriculum content)

The learning scenario is projected to present and explain the physical and chemical properties of metals for students in English terminology. The learning scenario aims to improve students English vocabulary and grammar related to the topic, to develop positive learning habits and cognitive learning skills. The scenario aims to engage the reflection on listening and watching experience and share the it with the peers, classmates.

This learning scenario is aimed at students of 15-16 years old.

Learning outcomes

Students will be able: to present and explain the physical and chemical properties of metals, they will acquire the basic English vocabulary connected with the topic. Students will be able to describe where metals are on the periodic table, describe metallic bonding, lust and give examples of physical properties of metals, present metals in the reactivity series, present reactions of acids with metals, present how to obtain metals from metal oxides.

Cognitive skills

Attention, perception, memorising, analytical, critical thinking, communication, collaborative learning, self-directed learning and problem solving skills.

Language Function

- Comparing and contrasting: X is similar to.../ X differs from Y in that
- Giving definition using relatives: X is a ...which...
- Expressing opinions and asking for opinions: What do you think about.....?/ My opinion is that.....What's yours?
- Classifying: The two types of....are....

Key language

Vocabulary:

- Properties, metals, the periodic table, elements, Zig zag line, majority, metallic bonding, atoms, bond, cation, electron, orbit, ion, lattice, dense, melting point, boiling point, conductors, electricity, cobalt, iron, nickel, tensile strength, wires, ring, potassium, sodium, calcium, magnesium, aluminium, zinc, tin, lead, copper, silver, gold, platinum, electronegativity, oxidation, examples, reaction, electronegativities, Group I, oxidise, oxidation number, transition metals, alkaline earth, transition, colour, variable valencies, catalysts, wiring, pipes, jewellery, chemically stable, alkali metals – Group I, alkaline earth metals – Group II, rusts, oxides, layer, base, multipurpose, mineral acids, salts, hydrochloric acid, hydrogen, ore, conductor

Co-funded by the Erasmus+ Programme of the European Union

Verb:

- Dissolve, react, burn, explode

Adjectives:

- Metallic, physical, chemical, positively charged, electropositive, lustrous, shiny, malleable, tensile, ductile, sonorous, magnetic, reactive, unreactive, medical, protective, amphoteric, neutralising, solid, insoluble, basic

Preposition:

- Left, below

Language structure:

- Present simple tense, conditional sentence construction, object description

Activities

The time required to complete the learning scenario is 4 hours: 2 lessons and 2 home assignments.
1st lesson: a teacher needs to select key vocabulary items that learners need to know and understand to be able to process the input in the videos and tasks. After that students watch video lesson Properties of metals 1: Physical Properties
https://clil4steam.pixel-online.org/video-library-sch.php?id_asch=24 and
Properties of Metals 2: Chemical Properties
https://clil4steam.pixel-online.org/video-library-sch.php?id_asch=25
Students write down key information, as well as focus on the vocabulary and the information shown.
Later the video could be discussed with students in English or their mother tongue.
Once the video is watched and notes are made every student will write the summary of the presented information and tell to the class.
Teachers may help students with grammar or vocabulary issues.
At the end of the lesson students take a short test to consolidate their knowledge:
https://clil4steam.pixel-online.org/tr_created-sch.php?id_asch=24&section_asch=creation

As homework, a teacher can ask students to watch the video
https://clil4steam.pixel-online.org/tr_reviewed-sch.php?id_asch=171&section_asch=review
and add some more information to the summary written in class. This video - an illustrative presentation of the properties of metals and non-metals, differences between them, is intended for students to replicate and consolidate acquired knowledge.

2nd lesson: students are invited to watch the videos and take notes according to a given structure (physical properties/ chemical properties/reactions with oxygen, water, acid, chlorine and hydrogen).
https://clil4steam.pixel-online.org/tr_reviewed-sch.php?id_asch=207&section_asch=review
https://clil4steam.pixel-online.org/tr_reviewed-sch.php?id_asch=27&section_asch=review

The teacher can use the watch-think-write strategy. The teacher fragments the video into its main sections. The teacher pauses the video after each section to allow students to process the information, to ask questions, discuss and complete the task. Thus students are given enough time to include the new information in their guided notes and summarize it.
Then students discuss key points (their notes) in pairs or groups; students use their guided notes as a way to explain the content to each other. Students complete their initial mind map with new words they want to retain and create concept maps based on prior knowledge and new ideas from the video sections they watched.
To finish the lesson students perform a multiple-choice questionnaire to assess their knowledge:
https://clil4steam.pixel-online.org/tr_reviewed-sch.php?id_asch=71&section_asch=review
The questionnaire can be assigned as homework.

The teacher can encourage students to study the text (website) at home.
https://clil4steam.pixel-online.org/tr_reviewed-sch.php?id_asch=29&section_asch=review
Teachers can give students a plan to follow and fill it in with notes taken while studying the content. The text is simple, accessible and accompanied by illustrations and graphs.
The site enables students to revise basic information about metals, students can do the test after the reading.

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Assessment FOR learning

The teacher will question the students and will provide the feedback with this way helping students to understand what successful work looks like for each task they are doing (for example – summarizing the content in the video, describing the diagram).

Assessment OF learning

Students will be assessed at the end of the unit. They will have to answer questions, solve problems, complete a presentation or write essays/reports according to the requirements of the national curriculum.

Material, resources, web tools

Video lesson

- https://clil4steam.pixel-online.org/video-library-sch.php?id_asch=24
- https://clil4steam.pixel-online.org/video-library-sch.php?id_asch=25

Created teaching resources

- https://clil4steam.pixel-online.org/tr_created-sch.php?id_asch=24&section_asch=creation

Reviewed teaching resources

- https://clil4steam.pixel-online.org/tr_reviewed-sch.php?id_asch=29&section_asch=review
- https://clil4steam.pixel-online.org/tr_reviewed-sch.php?id_asch=27&section_asch=review
- https://clil4steam.pixel-online.org/tr_reviewed-sch.php?id_asch=207&section_asch=review
- https://clil4steam.pixel-online.org/tr_reviewed-sch.php?id_asch=71&section_asch=review
- https://clil4steam.pixel-online.org/tr_reviewed-sch.php?id_asch=171&section_asch=review

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

CLIL for STEAM
Project Number: 2019-1-PL01- KA201-065027

Plastics and the 3 R's

Teacher	Country	School
Ioan Juncu Vlad Orza Mihaela Basu	Romania	EuroEd Secondary school, Vasile Alecsandri High school

Students' Age	Subject	Topic	Students' target level of competence (CEFR)	Language Skills
13-14	• Biology • Technology • Chemistry	Our plastic world	B1 B2	• Listening • Speaking • Reading • Writing • Interaction

Learning objectives (related to curriculum content)

The aim of this learning scenario is to learn what the plastics in our lives are, what their properties are, to understand the perils of plastics and to raise awareness about this type of pollution, thus creating and promoting social, cultural and behavioural citizenship values to ensure a more sustainable world.

Learning outcomes

Students will be able to:

- Understand what plastics and polymers are
- To talk about the history of plastic, its benefits and disadvantages
- Identify the three R's of reducing solid waste and give examples of each
- Discuss how people can do their part to impact solid waste reduction
- Think more about everyday life and about saving natural resources
- Finding solutions to plastic pollution

Cognitive skills

- Identifying the plastic in their lives
- Classifying the types of plastic according to their manufacture process and properties
- Spelling and reciting the different names of plastics
- Matching the words to their definitions
- Analysing a situation
- Describing a current situation
- Making recommendations on how to reduce, reuse and recycle plastics
- Designing a poster to raise awareness of the plastic pollution

Language Function

- Asking questions
- Debating over an issue
- Comparing and contrasting
- Making recommendations
- Persuading

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Key language

Vocabulary:

- Carbon, organic chemistry, natural, synthetic, man-made, proteins, amino acids, hydrocarbons, polythene, Petroleum, polymers, polymer synthesis, plastic, plastic pollution, recycled, crude oil, refinery, fractional distillation, cracking, reforming, shaped, moulded, properties, chain, monomers, unsaturated, polythene, Nylon, polypropylene, polybutylene, polystyrene, Polyvinyl chloride (PVC), Teflon (PTFE), backbone, pure form, thermoplastic, reheated, reformed, degrade, packaging, waterproof coatings fabrics, fillings, dressings, hydrogels, soft contact lenses, disposable nappy liners, smart materials, memory shrink-wrap packaging, valuable resource, rubbish, litter, management, microbeads, cosmetic, wastewater, industrial processes, non-biodegradable, recycling, recovering, glass, plastic, organic, paper, trash can, rubbish, contamination, packaging, environment, damage, decomposition, container

Verb:

- Reduce, reuse, recycle, contaminate, classify, save, turn on/off, collect, store

Language structure:

- Modals
- 2nd Conditional
- Imperatives

Activities

Lesson 1 – Our plastic world – 1h

The teacher starts the lesson by asking the students if they are aware of the plastic items they use every day and how much they rely on it, and asks them to make a list of the plastic items that are part of their lives (*e.g. shopping plastic bags, water bottles, phones, cling film for wrapping etc.)*. Then the teacher asks the students to think how their lives would be without these items. For that, the students have to make sentences using 2nd Conditional.

After that the teacher shows the students the symbol of the universal recycling symbol, and after eliciting its meaning, tells the students that they will learn more about plastic, how it threatens our future, and what we can do to reduce the danger.

To stir the students' interest about the topic, the students watch the video at the following link https://ed.ted.com/lessons/a-brief-history-of-plastic#watch. The video may make an interesting introduction to plastics that can raise students' curiosity. The video presents highlights in the history of plastic and its evolution from a cost effective and widely used product opening up a lot of possibilities to a product damaging the environment. The video is accompanied by a short test that students can take to check the understanding of the video. In order to better understand what plastics are, how they are manufactured, the types of plastics and what the causes for the plastic pollution are, the students will watch a video, https://youtu.be/uXosZfD4kqY - Our plastic world. The teacher mentions the fact that the students' focus have to be on the types of plastics, their properties and names, and the problems with plastic and pollution. The teacher will pause the video from time to time to give further explanations and to allow the students to write down the specific vocabulary. After watching the video and practicing the pronunciation of the main plastics, the students do the interactive exercise https://wordwall.net/resource/8367674/plastic-world-cloze-test.

As home assignment, the students will have to watch the video https://youtu.be/PbuiIhr0LVA - 7 Different Types of Plastic and Their Uses about the plastics: types & uses, and do the accompanying quiz: https://wordwall.net/resource/19346449/different-types-plastics-their-uses.

Lesson 2 – The 3 R's - 1 h

The teachers asks the students to fill in a mind map about plastics so that they can better retain the specific vocabulary. Then the students are divided into three groups, each being assigned to one of the three R's: *Reduce, Reuse and Recycle.* The students will have to read the article https://www.conserve-energy-future.com/reduce-reuse-recycle.php and work collaboratively in order to come up with as many ideas of reducing, reusing and recycling the plastics as possible. The students have to use the modals for advice and recommendation (*should/ought to/ must/mustn't)*.

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

The teacher divides the class into groups of four and gives the students the following task, as homework assignment: they are environmental scientists and they have to come up with a series of design changes to make their school a more environmentally friendly school building. They have to present their design changes as a poster or a PowerPoint presentation. For each improvement they are making they must describe the change and how much they estimate it will cost to make the changes, explain the environmental problem(s) it helps solve, and include a diagram or picture.

Lesson 3 – We can save the world starting with our school – 1 h
The teacher tells the students that they will be assessed according to the following core values: *feasible solution, creativity, empathy and craftsmanship*. The students present their projects and in the end of the lesson the teacher starts a discussion on the difficulties the students encountered while working on their projects.

Assessment FOR learning

- Teacher monitors group, pair and individual activities
- Students participate in all tasks and activities
- Students interact with their partners (speaking creatively)
- Students use the new vocabulary in cooperation and communication tasks
- Students perform peer assessment

Assessment OF learning

- Poster or PowerPoint Presentation

Material, resources, web tools

Video Lessons

- https://youtu.be/uXosZfD4kqY - Our plastic world

Reviewed Teaching Resources

- https://clil4steam.pixel-online.org/teaching-resources-sch.php?id_asch=200&section_asch=review
- https://wordwall.net/resource/8367674/plastic-world-cloze-test

Other Resources

- https://ed.ted.com/lessons/a-brief-history-of-plastic#watch
- https://youtu.be/PbuiIhr0LVA - 7 Different Types of Plastic and Their Uses
- https://www.conserve-energy-future.com/reduce-reuse-recycle.php
- https://wordwall.net/resource/19346449/different-types-plastics-their-uses

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Project Number: 2019-1-PL01- KA201-065027

Pythagorean Theorem part 1

Teacher	Country	School
Aneta Seremak Agata Ziętek	Poland	Szkoła Podstawowa nr 5 im. Janusza Kusocińskiego w Świdniku

Students' Age	Subject	Topic	Students' target level of competence (CEFR)	Language Skills
13-14	• Math	Pythagorean Theorem	B1 B2	• Listening • Speaking • Reading • Writing • Interaction

Learning objectives (related to curriculum content)

Upon completion of this lesson, students should be able to:

- Define the Pythagorean theorem
- Solve equations using the Pythagorean Theorem
- Apply the Pythagorean theorem to determine unknown side lengths in right triangles
- Know key vocabulary in English

Learning outcomes

Students will be able to use the Pythagorean Theorem to solve real-world examples and mathematical problems in two and three dimensions.
Students will acquire the basic English vocabulary related to the Pythagorean Theorem.

Cognitive skills

Students will understand and be able to apply the Pythagorean Theorem calculations. They will be able to define what the Pythagorean Theorem is. They will improve their sustained, selective, divided attention, long term memory, logic, and reasoning.

Language Function

Students will be able to explain what the Pythagorean Theorem is.
Students will learn to describe, analyze, summarize and draw conclusions.

Key language

Vocabulary:

- Hypotenuse, triangle, angle, right-angle triangle, square root, leg, side, equation, formula

Verb:

- Work out, determine, form, solve, define

Language structure:

- Present simple tense and past simple, modal verbs, future simple.

Co-funded by the Erasmus+ Programme of the European Union

The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Activities

78) Introducing the topic and the key vocabulary.
79) Demonstrating the video lesson, when the teacher wants to ask questions and give an explanation to the content the video is paused.
80) Students are provided some time to work individually with the glossary to improve their reading skills and practice new vocabulary.
81) The teacher gives learners words or phrases which are associated with the glossary term and requires them to create mind maps of words in themes.
82) The teacher makes sure that students understand the content by giving them problems selected from slides. The teacher presents the slides and does pauses in certain moments to allow students to make notes, asks questions and develop some presented problems. The teacher should give them feedback and show students more examples on the blackboard. Students should do similar exercises in pairs.
83) Demonstration of the Pythagoras' Theorem Exercise and working in groups of three.
84) Students do the dictionary with new words presented during the lesson.
85) The teacher asks students to reflect on what they have learned and summarizes the lesson.
86) As homework teacher can ask students to create an e-book about the Pythagoras' Theorem and watch the video Math Antics - The Pythagorean Theorem

Assessment FOR learning

At the end of the classes the teacher questions the students, observes the students' work, and provides feedback and gives support.

Assessment OF learning

Students take a short test.

Material, resources, web tools

Video Lessons

- https://clil4steam.pixel-online.org/video-library-sch.php?id_asch=11

Created Teaching Resources

- https://clil4steam.pixel-online.org/teaching-resources-sch.php?id_asch=3&section_asch=creation
- https://clil4steam.pixel-online.org/teaching-resources-sch.php?id_asch=94&section_asch=creation

Reviewed Teaching Resopurces

- https://clil4steam.pixel-online.org/teaching-resources-sch.php?id_asch=156&section_asch=review
- https://clil4steam.pixel-online.org/teaching-resources-sch.php?id_asch=149&section_asch=review
- https://clil4steam.pixel-online.org/teaching-resources-sch.php?id_asch=42&section_asch=review

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

CLIL for STEAM
Project Number: 2019-1-PL01- KA201-065027

Pythagorean Theorem

Teacher	Country	School
Dovilė Žigienė	Lithuania	Trakų Vytauto Didžiojo gimnazija

Students' Age	Subject	Topic	Students' target level of competence (CEFR)	Language Skills
12-16	• Math	Pythagorean Theorem	B1 B2	• Listening • Speaking • Reading • Writing • Interaction

Learning objectives (related to curriculum content)

Upon completion of this lesson, students will be able to:

- Define the Pythagorean theorem
- Solve equations using the Pythagorean Theorem
- Know key vocabulary in English

Learning outcomes

Students will be able to:

Students will be able to apply the Pythagorean theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.

Cognitive skills

Students will develop self-motivation, problem solving, self-directed and independent learning skills. They will improve their sustained, selective, divided attention, long term memory, logic, and reasoning.

Language Function

In this lesson, students will use the language to define and prove the theorem, to solve and explain the equations.

Key language

Vocabulary:

- Pythagorean Theorem, Pythagoras Theorem, hypotenuse, triangle, angle, right-angle triangle, square root, leg, side, equation, formula, ratio, equality, expressions, a plain figure, equiangular, relationship, condition

Verb:

- Solve, define, prove, apply, determine, equals, multiply, consist

Language structure:

- Present simple; basic English vocabulary linking with mathematical and technical terms

Activities

33. Introducing the topic and topic-related vocabulary.
34. Demonstrating the video lesson.
35. The video is paused several times so that students have some time to think, ask questions, participate in the discussion.
36. During the review of the video the students are encouraged to write down the words that they want to learn.
37. Working in pairs, students practice proving the theorem to each other.

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

38. Working individually, students apply the Pythagorean theorem to solve mathematical problems.
39. Working in small groups, students compare and explain their solutions.
40. The teacher monitors the students' work and provides the necessary support when needed.
41. The teacher asks students to reflect on what they have learned in the lesson and summarizes the lesson.

Assessment FOR learning

The teacher will question the students and provide feedback in this way, helping the students to understand what the successful work looks like in each task (for example, proving the theorem, solving the equations).

Assessment OF learning

Students will be assessed at the end of the unit by completing an equation solution test.

Material, resources, web tools

Video lesson

- https://clil4steam.pixel-online.org/video-library-sch.php?id_asch=11
- https://clil4steam.pixel-online.org/video-library-sch.php?id_asch=23

Created teaching resources

- https://clil4steam.pixel-online.org/tr_created-sch.php?id_asch=19&section_asch=creation
- https://clil4steam.pixel-online.org/tr_created-sch.php?id_asch=94&section_asch=creation
- https://clil4steam.pixel-online.org/tr_created-sch.php?id_asch=3&section_asch=creation
- https://clil4steam.pixel-online.org/tr_created-sch.php?id_asch=5&section_asch=creation
- https://clil4steam.pixel-online.org/tr_created-sch.php?id_asch=59&section_asch=creation

Reviewed teaching resources

- https://clil4steam.pixel-online.org/tr_created-sch.php?id_asch=19&section_asch=creation
- https://clil4steam.pixel-online.org/tr_created-sch.php?id_asch=94&section_asch=creation
- https://clil4steam.pixel-online.org/tr_created-sch.php?id_asch=3&section_asch=creation
- https://clil4steam.pixel-online.org/tr_created-sch.php?id_asch=5&section_asch=creation
- https://clil4steam.pixel-online.org/tr_created-sch.php?id_asch=59&section_asch=creation

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Project Number: 2019-1-PL01- KA201-065027

"Reflection of light"

Teacher	Country	School
Annalisa Bassi	Italy	IIS Montale Nuovo IPC

Students' Age	Subject	Topic	Students' target level of competence (CEFR)	Language Skills
16-17	• Physics • Math	"Reflection of light"	B1	• Listening • Speaking • Reading • Writing • Interaction

Learning objectives (related to curriculum content)

The linguistic objectives are to teach students a correct scientific language and to give them the necessary instruments to be able to read and study a scientific article, to be able to watch and understand a video about reflection and refraction of light The specific aims are to stimulate the curiosity of the students in order to introduce the reflection of light and the laws that govern this phenomenon. The specific aims are to stimulate the ability of the students to give scientific explanations about the phenomenon observed and to use their curiosity in order to introduce the two laws of physics: refraction and reflection of light. The students will be motivated to reproduce the simple experiments that they have observed in the video.

Learning outcomes

Students will be able to observe, compare and make assumption or theories about the reflection and refraction of light.

Cognitive skills

To develop the observation skills and the ability to make connections and suppositions. To be able to be engaged in team work. To acquire and interpret information in a critical way through different contexts and through different communicative instruments.
To estimate the scientific credibility of the source and to discern the difference between facts and opinions

Language Function

- Classifying
- Describing
- Evaluating and Explaining
- Hypothesizing
- Inquiring/Questioning
- Planning and predicting
- Reporting

Key language

Vocabulary:

- All the vocabulary in the diagram on reflection of light and the glossary of the video

Language structure:

- Present simple and present continuous tense; adverbs of frequency; future tenses (will, present continuous, to be going to); modal verbs for deductions (may, can't, must); If clauses 1st type; imperative form

Co-funded by the Erasmus+ Programme of the European Union

Activities

Phase 1: Resources: Reflection of light. https://www.youtube.com/watch?v=dwxaq4c9K6k
The teacher uses one hour to show the video and to explain the law of reflexion. The flipped classroom approach could be useful: the students watch the video at home and then report to the class.

Phase 2: Resource: Light Absorption, Reflection, and Transmission. https://www.youtube.com/watch?v=DOsro2kGjGc&t=45s
The flipped classroom approach could be useful: the students watch the video at home and then report to the class.
Alternatively, teacher uses one hour to show the video and to introduce light as a particular wave. If the teacher has previously had some lessons about the waves (elastic waves) and he has already explained the characteristics: period, wavelength, frequency, speed, and so on, he can use this video to introduce the light as a particular wave (sum of electromagnetic waves) and see that this wave acts like the other waves.

Phase 3: Science Experiment | Physics | Reflection From a Plane Mirror.
https://www.youtube.com/watch?v=EZIWPXTHIUs
The teacher gives this video as homework, the students must try to reproduce what they have seen in the video.

Phase 4: Resource: Law of Reflection Practical Activity for Students
https://www.youtube.com/watch?v=ETF2-Zz3J18
Individual homework. One hour is needed to look at the online lab, it can be stopped when necessary: when the students ask questions or when the teacher wants to focus on a particular topic. Another hour is needed to reproduce these experiments. The students are asked to find other similar kinds of experiments on line at home (homework).

Assessment FOR learning

In phases 3 and 4 the students are very active: they are asked to reproduce an experiment in the lab and to report about it to the class. So they need to focus on the three key-questions of "Assessment for learning": What do I know? What do I want to learn? What have I learnt? The production of a Portfolio or an Oral Presentation could be useful to achieve awareness of the student's learning process.

Assessment OF learning

Assessment of learning will be achieved at the end of the phases, after the students have been involved in their research. It will test the content of the learning module: the law of physics: reflection of light. Part of the final grade will test the use of the correct language structures (present simple and present continuous tense; adverbs of frequency; future tenses (will, present continuous, to be going to); modal verbs for deductions (may, can't, must); If clauses 1st type; imperative form). A short essay or report could be used for this purpose as it will allow the teacher to test both the content and the language.

Material, resources, web tools

Video lesson

- https://www.youtube.com/watch?v=zHi6i-QAYj0&t=1s&ab_channel=CLIL4SteamProject

Reviewed teaching resources

- https://wordwall.net/resource/10136512

Reviewed teaching resources

- https://www.youtube.com/watch?v=dwxaq4c9K6k
- https://www.youtube.com/watch?v=DOsro2kGjGc&t=45s
- https://www.youtube.com/watch?v=EZIWPXTHIUs
- https://www.youtube.com/watch?v=ETF2-Zz3J18

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

CLIL for STEAM
Project Number: 2019-1-PL01- KA201-065027

"Refraction of light"

Teacher	Country	School
Annalisa Bassi	Italy	IIS Montale Nuovo IPC

Students' Age	Subject	Topic	Students' target level of competence (CEFR)	Language Skills
16-17	• Physics • Math	"Refraction of light"	B1	• Listening • Speaking • Reading • Writing • Interaction

Learning objectives (related to curriculum content)

The linguistic objectives are to teach students a correct scientific language and to give them the necessary instruments to be able to read and study a scientific article, to be able to watch and understand a video about reflection and refraction of light The specific aims are to stimulate the curiosity of the students in order to introduce the reflection of the light and the laws that govern this phenomenon. The specific aims are to stimulate the ability of the students to give scientific explanations about the phenomenon observed and to use their curiosity in order to introduce the two laws of physics: refraction and reflection of light. The students will be motivated to reproduce the simple experiments that they have observed in the video.

Learning outcomes

Students will be able to observe, compare and make assumption or theories about the reflection and refraction of light.

Cognitive skills

To develop the observation skills and the ability to make connections and suppositions. To be able to be engaged in team work. To acquire and interpret information in a critical way through different contexts and through different communicative instruments.
To estimate the scientific credibility of the source and to discern the difference between facts and opinions

Language Function

- Classifying
- Describing
- Evaluating and Explaining
- Hypothesizing
- Inquiring/Questioning
- Planning and predicting
- Reporting

Key language

Vocabulary:

- All the vocabulary in the diagram on reflection of light and the glossary of the video

Language structure:

- Present simple and present continuous tense; adverbs of frequency; future tenses (will, present continuous, to be going to); modal verbs for deductions (may, can't, must); If clauses 1st type; imperative form

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Activities

Phase 1: Resources: Refraction of the light.
https://www.youtube.com/watch?v=DR-8ZRCHCXI
The teacher uses two hours to watch the video and to explain the refraction law. One hour is needed to watch the video, it can be stopped when it is necessary. Another hour is needed for the lesson between the teacher and the students, to do some exercises and to watch the video a second time if necessary. While watching the video, the teacher must stop it to add information or explanations and to allow the students to ask questions, to take notes about the topic and to copy the patterns. The second hour is dedicated to formalise the topic, to do some exercises about Snell's law and to introduce the consequences of refraction.
The video can also be used with a flipped classroom approach: the students watch the video at home, they report to the class and then the teacher adds the information about refraction.

Phase 2: Resources: Refraction of Light Through a Glass Slab using Laser Beam.
https://www.youtube.com/watch?v=el8AUeZaljw
The teacher shows this video to the students, but he must follow step by step the projection and must explain the more complicate parts. The teacher could reproduce this experiment in the lab with the students.

Phase 3: Resource: Experiments on refraction, reflection and total internal reflection.
https://www.youtube.com/watch?v=gDA_nDXM-ck
Individual homework. One hour is needed to look at the online lab, it can be stopped when necessary: when the students ask questions or when the teacher wants to focus on a particular topic. Another hour is needed to reproduce these experiments. The students are asked to find some similar experiments on line at home (homework).

Phase 4: Resource The science of rainbows.
https://www.youtube.com/watch?v=5pYnC-ONdXQ
This video is a simple and amusing way to explain the rainbow phenomenon as an application of physical laws.
If the teacher has previously had some lessons about the waves (elastic waves) and he has already explained the characteristics: period, wavelength, frequency, speed, and so on, he can use this video to introduce the light as a particular wave (sum of electromagnetic waves) and see that this wave acts like the other waves. It is easier to explain the refraction and reflexion laws using the light because students can see and verify these easily. The teacher can explain the two laws and then make a connection with elastic waves.

Assessment FOR learning

In phases 2 and 3 the students are very active: they are asked to reproduce an experiment in the lab and to report about it to the class. So they need to focus on the three key-questions of "Assessment for learning": What do I know? What do I want to learn? What have I learnt? The production of a Portfolio or an Oral Presentation could be useful to achieve awareness of the student's learning process.

Assessment OF learning

Assessment of learning will be achieved at the end of the phases, after the students have been involved in their research. It will test the content of the learning module: the two laws of physics: refraction and reflection of light. Part of the final grade will test the use of the correct language structures (present simple and present continuous tense; adverbs of frequency; future tenses (will, present continuous, to be going to); modal verbs for deductions (may, can't, must); If clauses 1st type; imperative form). A short essay or report could be used for this purpose as it will allow the teacher to test both the content and the language.

Material, resources, web tools

Video lesson

- https://www.youtube.com/watch?v=zHi6i-QAYj0&t=1s&ab_channel=CLIL4SteamProject

Reviewed teaching resources

- https://wordwall.net/resource/10136512

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

- https://clil4steam.pixel-online.org/tr_created-sch.php?id_asch=17&section_asch=creation

Reviewed teaching resources

- https://www.youtube.com/watch?v=DR-8ZRCHCXI
- https://www.youtube.com/watch?v=el8AUeZaljw
- https://www.youtube.com/watch?v=gDA_nDXM-ck
- https://www.youtube.com/watch?v=5pYnC-ONdXQ

Co-funded by the Erasmus+ Programme of the European Union

The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

CLIL for STEAM
Project Number: 2019-1-PL01- KA201-065027

Relationships between predator and prey

Teacher	Country	School
Dalia Valikonienė	Lithuania	Trakų Vytauto Didžiojo gimnazija

Students' Age	Subject	Topic	Students' target level of competence (CEFR)	Language Skills
14-18	• Biology	Predator and prey	A2 B1	• Listening • Speaking • Reading • Writing • Interaction

Learning objectives (related to curriculum content)

This learning scenario aims to introduce topic-related vocabulary on predator and prey, explain the relationship between predator and prey and the importance of adaptation.
It also aims to improve students 'ability to describe diagrams and graphs.

Learning outcomes

Students will be able to: define predator and prey, explain the relationship between predator and prey and the importance of adaptation.
Having expanded their topic-related vocabulary on predator and prey, students will be able to describe diagrams and graphs with ease.

Cognitive skills

Students will develop self-motivation, analytical skills and problem solving skills

Language Function

Students will be able to explain the predator-prey relationship, to describe the diagrams and charts. Students will learn to analyze, compare, contrast, summarize and draw conclusions.

Key language

Vocabulary:

- Predator, prey, ecosystem, inter-related, interdependent, food chains, food webs, herbivore, carnivore, scavenger, scraps, carcasses, habitats, rodents, camouflage, venus fly trap, agility, stealth, relationship graph, adaptation, behaviour, variety, nutrients

Verb:

- Hunt, prey, ambush, stalk, fluctuate, decrease, increase, survive, evolve, signal, freeze, decline.

Language structure:

- The present simple, conditional sentences.

Activities

42. Introducing the topic and topic related vocabulary.
43. Demonstrating the video lesson.
44. The video lesson is stopped when the teacher wants to ask questions and make sure that students understand the content.

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

45. Students are given time to work individually with the Word wall to improve their reading skills and to practice new vocabulary.
46. The Rabbits and Wolves simulator. After watching the simulator and observing how the population s change over time, students answer the questions provided on the Predator Prey Simulation resource and describe the diagrams.
47. Students are assigned to use the project resources and prepare to explain the relationship between other animal species.

Assessment FOR learning

The teacher will question the students and provide feedback to help students understand what a successful job looks like in each task (for example describing the diagram). Teachers using cumulative assessment can award cumulative points for correct answers to questions: How do predators benefit a prey population? What are the benefits of a hard outer shell for prey? How does the color of the prey help prevent predators? Additional points should be awarded for correct use of grammar structures grammar.

Assessment OF learning

Predator and Prey is a part of the module Organisms and Their Environment. Students will be assessed when they finish studying the module.

They will have to answer questions, solve problems, complete a presentation or write essays/reports according to the requirements of the national curriculum.

Material, resources, web tools

Video lesson

- https://clil4steam.pixel-online.org/video-library-sch.php?id_asch=13

Created teaching resources

- https://clil4steam.pixel-online.org/tr_created-sch.php?id_asch=97&section_asch=creation
- https://clil4steam.pixel-online.org/tr_created-sch.php?id_asch=28&section_asch=creation
- https://clil4steam.pixel-online.org/tr_created-sch.php?id_asch=96&section_asch=creation
- https://clil4steam.pixel-online.org/tr_created-sch.php?id_asch=4&section_asch=creation

Reviewed teaching resources

- https://clil4steam.pixel-online.org/tr_reviewed-sch.php?id_asch=34&section_asch=review
- https://clil4steam.pixel-online.org/tr_reviewed-sch.php?id_asch=94&section_asch=review
- https://clil4steam.pixel-online.org/tr_reviewed-sch.php?id_asch=166&section_asch=review
- https://clil4steam.pixel-online.org/tr_reviewed-sch.php?id_asch=175&section_asch=review
- https://clil4steam.pixel-online.org/tr_reviewed-sch.php?id_asch=193&section_asch=review
- https://clil4steam.pixel-online.org/tr_reviewed-sch.php?id_asch=209&section_asch=review
- https://clil4steam.pixel-online.org/tr_reviewed-sch.php?id_asch=33&section_asch=review

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Project Number: 2019-1-PL01- KA201-065027

Renewable Energies (1)

Teacher	Country	School
Beata Adasik	Poland	Szkoła Podstawowa nr 5 w Świdniku

Students' Age	Subject	Topic	Students' target level of competence (CEFR)	Language Skills
13-15	• Biology	Renewable Energies	A2 B1	• Listening • Speaking • Reading • Writing • Interaction

Learning objectives (related to curriculum content)

The objectives of the learning scenario are:

- Knowing that there are different types of energy
- Analysis of various types of energy, their division into renewable and non-renewable
- Understanding that renewable energy is much more environmentally friendly
- The belief that the exploration of natural resources and the processing of them into traditional energy is destructive for our planet
- Analysis of various types of alternative energy sources,
- Perceiving the positive and negative aspects of the use of renewable energies
- Predict the future of using alternative energy sources

Learning outcomes

Learners will be able to: This field describes how learners are able to apply the Learning Objectives
After applying this scenario, students will be able to analyze the positive impact of the use of renewable energy sources in everyday life and the impact on the natural environment

Cognitive skills

- Listing what types of energy exist and what energy is needed for in everyday life
- Analyzing the positive and negative features of renewable and non-renewable energy
- Listing the ways of using renewable energy in the future
- Describing sources from which people can get renewable energy

Language Function

Students will be able to:

- List the types of renewable energy and their sources
- Reading and understanding simple text
- Listening and watching a movie about types of energy, and about different energy sources
- Understanding how important it is for the natural environment to use natural energy sources in everyday life and discuss providing argumentation.

Key language

Vocabulary:

- Energy, renewable energies, nonrenewable energies, solar power, geothermal power, plants, steam, greenhouse effect, environment, safe, air, wind, water, tides, flowing, soil, fossil fuels, oil, coal, natural gas, metallic, minerals, salt, phosphates, green energy, heat, cool the building, pumps, photovoltaics, light, plants, animals, nuclear energy, greenhouse effect, affordable, efficiency, downside, biomass.

Co-funded by the Erasmus+ Programme of the European Union

Verb:

- Use, replenish, transform, disrupt, retain, reverse, run out, decrease

Language structure:

- Present simple, present passive.

Activities

48. Students wonder what a person needs energy for in everyday life, then what it means that energy sources can be renewable and non-renewable
49. The teachers shows the students the first resource (with the energy sources). Students analyze it to check if their guesses were correct as well as learning new vocabulary
50. Pupils watch a video giving information about which energy sources are renewable and which are not
51. Students discuss in a group the impact of renewable and non-renewable energy sources on the environment. They wonder whether they use renewable or non-renewable energy sources in their everyday lives. They wonder what the approach of the local council to the issue of using alternative energy sources is. They prepare a questionnaire for interviewing their school friends and relatives to find out how many people have heard about alternative energy sources and how many people use them
52. Students work individually, creating a list of the most popular uses of alternative energy sources in their country, then in pairs compare the lists, trying to create one list.
53. Students listen to the next recording https://clil4steam.pixel-online.org/video-library.php
54. They pay attention to the pronunciation of new words.
55. The teacher asks students to think about how they can influence the local community to use renewable energy sources. They must prepare an advertising slogan about environmental protection by using alternative energy sources
56. As homework, students watch the 2 remaining videos to summarize what they have learned and practice the new vocabulary.

Assessment FOR learning

Students fill in a handout with definitions, distinguishing between renewable and non-renewable energy sources

Assessment OF learning

Vocabulary test

Material, resources, web tools

Video Lessons

- https://clil4steam.pixel-online.org/video-library.php
- https://clil4steam.pixel-online.org/video-library-sch.php?id_asch=34

Other resources

- https://microsite-vadoe-prod.s3.amazonaws.com/media/thumbnails/2c/31/2c31a9ebbcd3c715ccc4ebce0a7828b4.jpg
- https://www.youtube.com/watch?v=osBVRfvkmAU
- https://www.youtube.com/watch?v=PLBK1ux5b7U
- https://quizlet.com/es/524396722/renowable-energy-flash-cards/

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Project Number: 2019-1-PL01- KA201-065027

Renewable Energies (2)

Teacher	Country	School
Andrius Storta	Lithuania	Trakų Vytauto Didžiojo gimnazija

Students' Age	Subject	Topic	Students' target level of competence (CEFR)	Language Skills
14-18	• Physics • Biology	Renewable Energies	B1 B2	• Listening • Speaking • Reading • Writing • Interaction

Learning objectives (related to curriculum content)

This learning scenario aims to introduce topic-related vocabulary on renewable and non-renewable resources, compare renewable and non-renewable resources, explain how to use the heat "trapped" into the ground, explain advantages and limits of renewable energies.

Learning outcomes

Students will be able to:

- describe energy inside the Earth,
- Compare renewable and non-renewable resources,
- Explain how to use the heat "trapped" into the ground,
- Explain advantages and limits of renewable energies.

Cognitive skills

Students will develop self-motivation, analytical and problem solving skills.

Language Function

Students will develop self-motivation, analytical and problem solving skills.

Key language

Vocabulary:

- Energy, renewable energy, non-renewable, fossil fuels, geothermal, solar, semiconductors, terawatt, demand, transition, decrease, the inner core, the outer core, the mantle, the crust, exosphere, thermosphere, mesosphere, stratosphere, troposphere, radioactive decay, turbulent currents, advection, convection, conduction, consumption

Verb:

- Drill, compare, replace

Language structure:

- The present simple, conditional sentences

Activities

57. Introducing the topic and topic related vocabulary.
58. Demonstrating the video lesson.
59. The video lesson is paused when the teacher wants to ask questions and make sure that students understand the content.
60. Working individually, students read the script to improve their reading skills and to practice new vocabulary.

Co-funded by the Erasmus+ Programme of the European Union

The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

61. Working individually, students practice topic related vocabulary using wordwall.
62. Working in pairs, students exchange the information they have learned.
63. Teacher encourages students to discuss the topic.
64. The teacher asks students to reflect on what they have learned in the lesson and summarizes the lesson.

Assessment FOR learning

The teacher will question the students and provide the feedback.

Assessment OF learning

Students will be assessed at the end of the unit. They will have to answer questions, solve problems, complete a presentation or write essays/reports according to the requirements of the national curriculum.

Material, resources, web tools

Video lesson

- https://clil4steam.pixel-online.org/video-library-sch.php?id_asch=13

Created teaching resources

- https://clil4steam.pixel-online.org/tr_created-sch.php?id_asch=97&section_asch=creation
- https://clil4steam.pixel-online.org/tr_created-sch.php?id_asch=28&section_asch=creation
- https://clil4steam.pixel-online.org/tr_created-sch.php?id_asch=96&section_asch=creation
- https://clil4steam.pixel-online.org/tr_created-sch.php?id_asch=4&section_asch=creation

Reviewed teaching resources

- https://clil4steam.pixel-online.org/tr_reviewed-sch.php?id_asch=34&section_asch=review
- https://clil4steam.pixel-online.org/tr_reviewed-sch.php?id_asch=94&section_asch=review
- https://clil4steam.pixel-online.org/tr_reviewed-sch.php?id_asch=166&section_asch=review
- https://clil4steam.pixel-online.org/tr_reviewed-sch.php?id_asch=175&section_asch=review
- https://clil4steam.pixel-online.org/tr_reviewed-sch.php?id_asch=193&section_asch=review
- https://clil4steam.pixel-online.org/tr_reviewed-sch.php?id_asch=209&section_asch=review
- https://clil4steam.pixel-online.org/tr_reviewed-sch.php?id_asch=33&section_asch=review

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

CLIL for STEAM
Project Number: 2019-1-PL01- KA201-065027

Shadows and eclipses

Teacher	Country	School
Vatavu Mihaela Ioan Juncu Vlad Orza	Romania	EuroEd Secondary School

Students' Age	Subject	Topic	Students' target level of competence (CEFR)	Language Skills
15-16	• Physics • Technology	Let's go in to orbit!/ Reflection and refraction	B1	• Listening • Speaking • Reading • Writing • Interaction

Learning objectives (related to curriculum content)

The aim of this learning scenario is to provide students with an understanding of light and shadows, how shadows are formed, to demonstrate how shadows are formed in space, and to introduce lunar and solar eclipses.

Learning outcomes

Students will be able to:

- Investigate that light travels in a straight line
- Explain the formation of shadows and eclipses
- Predict the location, size and shape of a shadow from a light source relative to the position of objects
- Identify scientific facts related to a solar eclipse, such as shadow, the rotation of the moon, and the rotation of earth
- Explore ways to safely observe a solar eclipse
- Explain what a solar eclipse and a lunar eclipse are
- State the difference between a solar eclipse and lunar eclipse

Cognitive skills

- Listing light and shadow facts
- Matching the key words with their definitions
- Describing how shadows are formed
- Conducting an experiment to observe the change of shadows
- Predicting a phenomenon
- Analysing the results of an experiment
- Showing the similarities and differences between lunar and solar eclipse
- Presenting a piece of writing

Language Function

- Asking questions
- Comparing and contrasting
- Analysing
- Classifying
- Predicting
- Applying
- Instructing

Key language

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Vocabulary:

- Light, wave, photons, particle, visible, opaque, transparent, translucent, reflect, eclipse, light source

Verb:

- To travel, to bounce, to block

Language structure:

- Present Simple
- Adjectives and comparatives
- Passive voice
- Future simple for predictions

Activities

Lesson 1 - Light and shadows -1h

The teacher starts the lesson by asking the students if they have ever seen a shadow. Then she/he presents the topic of the lesson: light and shadows. The teacher starts a discussion by asking the following questions: *Why do we see things? Do all objects have shadows? What do we need to make a shadow?* After eliciting the answers, the teacher invites the students to see two videos: https://youtu.be/zHi6i-QAYj0 - Reflection and refraction (up to min 1:09 and https://www.youtube.com/watch?v=fy7eoMef3e8 -Light and Shadows/Types of Light/ How shadows are formed. Before watching the videos, the teacher groups the students in teams of four and asks them to write as much information related to light possible from the two videos. The team who have the most facts about light wins. After watching the video and sharing the information the students have collected, the students do an interactive exercise, https://wordwall.net/resource/43360/science/light-shadow-quiz.

Then the teacher asks the students if they have noticed that shadows change in length and in shape and invites them to give reasons for this. After the discussion, the teacher invites the students to watch https://www.youtube.com/watch?v=okuDo1-78as - How shadows change, and presses the pause button from time to time to allow students to answer the video quiz. In the end the teacher gives the students further explanations if necessary.

Next, the teacher divides the students in groups of four and tells them that they are going to use a flashlight, a pencil and a sheet of paper to observe what happens with the shadow of an object (pencil) when the source of light changes direction. The students must place the pencil perpendicular on the sheet of paper and then move the flashlight in different positions. To understand the change in length of the shadow, the students use a piece of white cardboard acting like a screen and project the shadow of the pencil on it, moving the pencil closer or farther from the source of light. Each student in the group is given a special role, and together they have to write down their observations in an observation sheet. In the end, the students present their work in class.

For a better understanding of how shadow change, the students have the following home assignment: they will have to read the following material: https://www.rutherfordhouseschool.co.uk/wp-content/uploads/2020/07/Science-investigating-shadows.pdf and answer all the questions in it. They also have to watch https://youtu.be/APIIX6HUVI8 - Let's go in to orbit! to review what they have already studied about orbits and the solar system.

Lesson 2 – Solar and Lunar Eclipses – 1 h

The teacher checks the assignment.

The teacher shows the students the image of a solar eclipse and starts a discussion using the following questions: *Do you know what's happening in these pictures? Do you know how eclipses are created?* The students can check their answers while watching the video https://www.youtube.com/watch?v=cxrLRbkOwKs – Solar eclipse. The teacher divides the students into groups of four and asks them to make notes so that they could answer the questions of the quiz https://www.nagwa.com/en/worksheets/397154708582/.

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Then the teacher asks students if they have knowledge of lunar eclipses and invites them to watch https://www.youtube.com/watch?v=VW2xRR75lKE – Lunar eclipse. While watching the video, the students will have to make notes so that they could answer the following quiz: https://quizizz.com/admin/quiz/579640af3643ca04465f59df/lunar-eclipse.

Then, the students, divided in groups of four, will work collaboratively to write a paragraph in which they highlight the similarities and the differences between the two types of eclipses.

In the end of the lesson, the students present their work in front of the class and get feedback from their peers.

Assessment FOR learning

- Teacher monitors individual, pair and group activities
- Students work autonomously to conduct an experiment
- Students interact with partners (speaking creatively)
- Students participate in all tasks and activities
- Students successfully solve quizzes
- Students do self and peer assessment

Assessment OF learning

- Written paragraphs as accounts for the students' collaborative work

Material, resources, web tools

Video Lessons

- https://youtu.be/zHi6i-QAYj0 - Reflection and refraction
- https://youtu.be/APIIX6HUVI8 - Let's go in to orbit!

Reviewed Teaching Resources

- https://clil4steam.pixel-online.org/tr_reviewed-sch.php?id_asch=177&section_asch=review

Other Resources

- https://www.youtube.com/watch?v=fy7eoMef3e8 -Light and Shadows/Types of Light/ How shadows are formed.
- https://wordwall.net/resource/43360/science/light - shadow-quiz
- https://www.youtube.com/watch?v=okuDo1-78as - How shadows change
- https://www.rutherfordhouseschool.co.uk/wp-content/uploads/2020/07/Science-investigating-shadows.pdf
- https://www.youtube.com/watch?v=cxrLRbkOwKs – Solar eclipse
- https://www.nagwa.com/en/worksheets/397154708582/
- https://www.youtube.com/watch?v=VW2xRR75lKE -Lunar eclipse
- https://quizizz.com/admin/quiz/579640af3643ca04465f59df/lunar-eclipse

Materials

- Multimedia: visual, auditory, digital
- Flashlight
- Posters
- Paper
- Pencils

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Project Number: 2019-1-PL01- KA201-065027

Solar-powered life

Teacher	Country	School
Marcin Paśnikowski	Poland	Szkoła Podstawowa nr 5 im. Janusza Kusocińskiego w Świdniku

Students' Age	Subject	Topic	Students' target level of competence (CEFR)	Language Skills
13-15	• Chemistry • Arts	Solar energy	A2 B1	• Listening • Speaking • Reading • Writing • Interaction

Learning objectives (related to curriculum content)

The objectives of the learning scenario are:

- Understanding the concepts of solar power
- Understanding how solar panels work
- Noticing the positive and negative aspects of solar energy

Learning outcomes

Students will be able to: This field is dedicated to describe how the students is able to apply the learning objectives
After applying this scenario students will be able to analyse the positive and negative impact of solar energy and will be able to discuss the ways to use it to protect the environment.

Cognitive skills

- Naming various examples of solar-powered machines and appliances
- Analyzing the positive and negative aspects of the solar energy
- Listing the ways solar energy could be used in the future
- Evaluating the pros and cons of solar energy

Language Function

Students will be able to:

- Name solar-powered machines and appliances they encounter in everyday life
- Reading and understanding a simple text
- Creating a short text e.g. a song or a rap

Key language

Vocabulary:

- Alternative energy sources, array, atom, core, fossil fuel, generator, renewable, nonrenewable, semiconductor, turbine, unreliable, nuclear fusion, radiation.

Verb:

- Generate, research, install, contain, pollute, cause, fuse

Language structure:

Co-funded by the Erasmus+ Programme of the European Union

The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

- The Present Continuous to express a gradual development of a process
- The Present Perfect to describe recent changes
- The Future Simple express predictions
- The Zero Conditional to describe laws of nature

Activities

87) The teacher asks students a question “What do you know about solar energy and its origins?”. First, students work individually, writing down their ideas. Then, they form pairs to compare and discuss their ideas. Lastly, pairs join to form groups of four and discuss what they have found out. This way they can practice peer-teaching and assess each other’s work
88) Students read the first chapter of the ebook entitled “Finding Out about Solar Energy” to find out if their guesses were correct
89) Students continue reading to learn about the ways of collecting and storing energy.
90) The teacher asks students to think of solar energy is only positive or if it has any negative aspects. They read Chapter 3 of the ebook to find out. Students divide into groups and prepare a song or a rap trying to present its positive and negative influence. After they finish, they present in front of the whole class.
91) Students read the last chapter of the ebook about the future of solar energy. Then, they prepare an interactive presentation of their predictions.

Assessment FOR learning

Students evaluate their knowledge by filling in a chart “Now I can”. They create a portfolio with a printout of their presentations and the song/rap.

Assessment OF learning

Vocabulary quiz.

Material, resources, web tools

Other Resources

- https://www.getepic.com/app/read/9044

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Project Number: 2019-1-PL01- KA201-065027

STEM CELLS
Fundamental Characteristics

Teacher	Country	School
Diana Carino	Italy	IIS Montale Nuovo IPC

Students' Age	Subject	Topic	Students' target level of competence (CEFR)	Language Skills
16-17	• Biology	STEM CELLS Fundamental Characteristics	B1	• Listening • Speaking • Reading • Interaction

Learning objectives (related to curriculum content)

Linguistic aims

Improving language skills in L2. Enriching scientific vocabulary. Knowing how to move from one linguistic register to another. Producing clear and coherent texts in L2 and summarizing written texts.

Subject specific aims

Identify the fundamental characteristics of a stem cell; know how to classify it based on its origin and differentiate its power; understand the difference between an embryonic stem cell and an adult stem cell; know the structure of the bone marrow; the meaning of hematopoietic; know the sources of hematopoietic cells, the differences between myeloid stem cells and lymphoid stem cells; know the composition of blood and its main functions; identify the component cells of a typical blood smear.

Learning outcomes

Students will be able to:

- Observe, analyse and describe phenomena belonging to natural reality and to the aspects of daily life.
- Formulate hypotheses and verify them.
- Use simple schematizations and modelling.
- Acquire and understand information and know how to connect it.
- Face problematic situations.

Cognitive skills

The purpose of the teaching unit is to approach students to the world of research and to stimulate a critical and conscious attitude towards them.

In general, the entire teaching unit wants to provide an overview of stem cells: what they are, how they are classified, where they are, what function they perform and how they can be used. The embryonic stem cell study offers high expectations in the treatment of a large number of pathologies. This teaching unit focuses on the analysis of hematopoietic cells, adult stem cells which are found mainly in the bone marrow, peripheral blood and umbilical cord. They are the most studied stem cells and used for therapeutic purposes and do not pose ethical problems.

Language Function

Comparing, describing, evaluating and explaining, hypothesizing, Inquiring/questioning, planning and predicting, reporting

Co-funded by the Erasmus+ Programme of the European Union

The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Project Number: 2019-1-PL01- KA201-065027

Key language

Vocabulary:

- All the vocabulary in the glossary of the video lesson and of the interactive activities (created resources)

Language structure:

- Present simple and present continuous tense; adverbs of frequency; future tenses (will, present continuous, to be going to); modal verbs for deductions (may, can't, must); If clauses 1st type; imperative form

Activities

Phase 1: Video Lesson: Stem Cells https://www.youtube.com/watch?v=aRACHGP7Yho&ab_channel=CLIL4SteamProject
Stem cells First part Web Site/Portal https://www.yourgenome.org/facts/what-is-a-stem-cell
These resources must be previously watched and read at home. At school the teacher will comment and explain them.
The Teacher divides the class into small groups. Each group must build a concept map or a flowchart by inserting most of the new terms acquired.
Students must then carry out the following interactive activities: "Stem Cells Match up quiz- Stem Cells Multiple choice quiz"
https://wordwall.net/resource/10140423
https://wordwall.net/resource/9625428

Phase 2: Bone marrow - hematopoietic stem cells Article
https://www.thoughtco.com/bone-marrow-anatomy-373236
This resource must be previously watched and read at home.
The teacher describes the topic highlighting the importance of the bone marrow for the production of blood cells and for immunopoiesis. To facilitate understanding of the text the article is divided into short paragraphs that students must summarize and schematize. Various exercises are then proposed which can be questionnaires with true/false answer, multiple choice, open-ended questions, answer questions, complete sentences, associate terms, keywords, use of certain words to write sentences. The class is then divided into small groups and each one is assigned a topic of the resource that must be studied in depth with personal research that can also include videos or animations of the topic, this to enhance listening skills.

Phase 3: Blood cell observations under a microscope Web Site/Portal
http://medcell.med.yale.edu/systems_cell_biology/blood_lab.php
This resource must be previously watched and read at home
The teacher comments and illustrates the resource with a frontal and interactive lesson, involving students and stimulating their attention and participation. The class is divided into small groups. To facilitate understanding of the text, the resource is divided into short paragraphs that students must summarize and schematize. In addition, students must learn to recognize the various blood cells by studying and comparing the various images present in the resource. This will help them recognize and analyse the slides they will then see during laboratory activity.

During the laboratory activity, students will have to observe a slide of blood smear already prepared (in school laboratories fresh blood use is forbidden). A 200-fold magnification is sufficient to observe and identify the different cell types. Numerous erythrocytes and some isolated white blood cells can be observed. At the end of the observation and identification of the cells, the students will have to make a short report, answer a questionnaire provided by the teacher and discuss both within their own group and with the other groups.

Phase 4: Presentation of the work of the individual groups

Assessment FOR learning

In in the various phases the students are very active: they are asked to look for similar information on the web and to report about it to the class; they are asked to create questionnaires and quizzes and to take part in class discussions. So they need to focus on the three key-questions of "Assessment for learning" : What do I know? What do I want to learn? What have I learnt? The production of a questionnaire, crosswords, quizzes, kahoot games could be useful to achieve awareness of the student's learning process. https://kahoot.com/

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Assessment OF learning

Assessment of learning will be achieved at the end of the phases, after the students have been involved in their research. It will test the content of the learning module: an overview of stem cells: what they are, how they are classified, where they are, what function they perform and how they can be used. Part of the final grade will test the use of the correct language structures (present simple and present continuous tense; adverbs of frequency; future tenses (will, present continuous, to be going to); modal verbs for deductions (may, can't, must); If clauses 1st type; imperative form). A short essay or report could be used for this purpose as it will allow the teacher to test both the content and the language.

Material, resources, web tools

Video lesson

- https://www.youtube.com/watch?v=aRACHGP7Yho&ab_channel=CLIL4SteamProject

Created teaching resources

- https://wordwall.net/resource/10140423
- https://wordwall.net/resource/9625428

Reviewed teaching resources

- https://www.yourgenome.org/facts/what-is-a-stem-cell
- https://www.thoughtco.com/bone-marrow-anatomy-373236
- http://medcell.med.yale.edu/systems_cell_biology/blood_lab.php

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Project Number: 2019-1-PL01- KA201-065027

STEM CELLS
Hematopoietic stem cell transplantation and HLA typing

Teacher	Country	School
Diana Carino	Italy	IIS Montale Nuovo IPC

Students' Age	Subject	Topic	Students' target level of competence (CEFR)	Language Skills
16-17	• Biology	Stem cells Hematopoietic stem cell transplantation and HLA typing	B1	• Listening • Speaking • Reading • Interaction

Learning objectives (related to curriculum content)

Linguistic aims

Improving language skills in L2. Enriching scientific vocabulary. Knowing how to move from one linguistic register to another. Producing clear and coherent texts in L2 and summarizing written texts.

Subject specific aims

The main purpose of this resource is to understand what a bone marrow transplant is and when it is performed and the vital role played by the HLA system for transplants.
In fact, if the transplanted tissue in a subject is not HLA-compatible (ie its cells do not have the same HLA antigens as the recipient), the transplant is recognized as foreign and rejected. For this reason, before performing a transplant, it is of primary importance to ensure that the donor and recipient are HLA-compatible. In addition to the field of organ and tissue transplants, the molecules of the HLA system are of fundamental importance in the mechanisms of immunological recognition of all foreign substances that come into contact with the organism.

Learning outcomes

Students will be able to:

- Observe, analyse and describe phenomena belonging to natural reality and to the aspects of daily life.
- Formulate hypotheses and verify them.
- Use simple schematizations and modelling.
- Acquire and understand information and know how to connect it.
- Face problematic situations.

Cognitive skills

Cognitive skills are: to improve language skills and specific scientific knowledge, and also to sensitize young people to the donation of bone marrow and hematopoietic stem cells.
Choosing to become a donor is a gesture of great solidarity and generosity that can save a life. Compatibility between non consanguineous is rare, only 1 donor out of 100,000 is 100% compatible with those waiting for a transplant, which is why young people must understand that by increasing the number of possible donors
it increases the likelihood of finding a suitable and compatible donor.

Language Function

Comparing, describing, evaluating and explaining, hypothesizing, Inquiring/questioning, planning and predicting, reporting

Co-funded by the Erasmus+ Programme of the European Union

The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Project Number: 2019-1-PL01- KA201-065027

Key language

Vocabulary:

- All the vocabulary in the glossary of the video lesson and of the interactive activities (created resources)

Language structure:

- Present simple and present continuous tense; adverbs of frequency; future tenses (will, present continuous, to be going to); modal verbs for deductions (may, can't, must); If clauses 1st type; imperative form

Activities

Phase 1: Video Lesson: Stem Cells https://www.youtube.com/watch?v=aRACHGP7Yho&ab_channel=CLIL4SteamProject
Stem cells First part Web Site/Portal
https://www.yourgenome.org/facts/what-is-a-stem-cell
Stem Cells Multiple Choice Quiz
https://wordwall.net/resource/9625428
This video and the article must be previously watched and read at home. At school the teacher will comment and explain them.
The Teacher divides the class into small groups. Each group must build a concept map or a flowchart by inserting most of the new terms acquired.
Students must then carry out the following interactive activity: Stem Cells Multiple Choice Quiz

Phase 2: Hematopoietic stem cell transplantation Web Site/Portal
https://www.cancer.ca/en/cancer-information/diagnosis-and-treatment/stem-cell-transplant/?region=qc
This resource must be previously watched and read at home
After presenting the resource (until "Finding a donor"), the teacher divides the class into small groups, each of which must analyse, study it independently and integrate it with personal research.
The students must also make a list of all the scientific terms present in the resource and know how to contextualize them in a written and oral production.
Inside the individual groups, students will have to discuss both the topic and the linguistic difficulties that have emerged and possibly the understanding of the concepts. In this way, students acquire greater confidence and awareness and are ready to face the confrontation with other groups.
The discussion between the various groups starts with a brainstorming introduced by stimulus questions: why is transplant important? What pathologies can it cure? Would you do it? Why yes? Why not? Etc.

Phase 3: HLA Video https://www.youtube.com/watch?v=t9TvTmddanE&t=37s
This resource must be previously watched and read at home
The teacher briefly recalls the basic concepts of immunity and then introduces the resource, highlighting the importance of the function performed by the HLA and the link between this complex and the action of the immune system. Therefore, students divided into small groups face the analysis and study of the resource. To facilitate understanding of the video, it is divided into shorter parts that students must study and, if necessary, deepen. In addition, to facilitate understanding of the topic, various exercises are proposed such as questionnaires with true / false answers, multiple choice, open questions, answer questions, completion of sentences, association of terms, keywords, use of certain words to write sentences.

Phase 4: Presentation of the work of the individual groups

Assessment FOR learning

In the various phases the students are very active: they are asked to look for similar information on the web and to report about the class; they are asked to create questionnaires and quizzes and to take part in class discussions. So they have to focus on the three key questions of 'Assessment for learning': what do I know? What do I want to learn? What have I learned? The production of a questionnaire, crossword puzzles, quizzes, kahoot games could be useful for gaining awareness of the student's learning process https://kahoot.com/.

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Assessment OF learning

Verification of learning will take place at the end of the phases, after the students have been involved in their research. The teacher will check the content of the learning module: how hematopoietic stem cells are used, what bone marrow transplantation is, what compatibility means, what HLA typing is.

Part of the final grade will verify the use of correct linguistic structures (present simple and present continuous; adverbs of frequency; future (will, present continuous, to be going to); modal verbs for deductions (may, can't, must); If 1st type propositions; imperative form). A short essay or report could be used for this purpose as it will allow the teacher to test both the content and the language.

Material, resources, web tools

Video lesson

- https://www.youtube.com/watch?v=aRACHGP7Yho&ab_channel=CLIL4SteamProject

Created teaching resources

- https://wordwall.net/resource/9625428
- https://www.yourgenome.org/facts/what-is-a-stem-cell

Reviewed teaching resources

- https://www.yourgenome.org/facts/what-is-a-stem-cell
- https://www.cancer.ca/en/cancer-information/diagnosis-and-treatment/stem-cell-transplant/?region=qc
- https://www.youtube.com/watch?v=t9TvTmddanE&t=37s

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Project Number: 2019-1-PL01- KA201-065027

The battle of green energies

Teacher	Country	School
Mihaela Vatavu Elza Gheorghiu Irina Farcas Cristina Smirnov	Romania	EuroEd Secondary School, Vasile Alecsandri High School

Students' Age	Subject	Topic	Students' target level of competence (CEFR)	Language Skills
17-18	• Physics • Biology • Chemistry	Renewable energies	B2	• Listening • Speaking • Reading • Writing • Interaction

Learning objectives (related to curriculum content)

The aim of this learning scenario is to understand what renewable and non-renewable energies are, to differentiate between them, to understand the correct management of resources, to learn about solar and geothermal energy and to sustain a debate about the pros and cons of using these renewable energies.

Learning outcomes

Students will be able to:

- Distinguish, classify and briefly describe the main renewable and non-renewable energy resource types
- Differentiate between renewable and non-renewable resources
- Provide examples of each
- Explain the contribution of technology to change the use of non – renewable to renewable resources
- Discuss the pros and cons of using solar energy
- Discuss the pros and cons of using geothermal energy

Cognitive skills

- Identifying the sources of energy
- Classifying the energies
- Defining types of energy
- Comparing types of energy
- Analysing pros and cons of using different types of renewable energies
- Justifying an opinion
- Writing a resolution

Language Function

- Agreeing and disagreeing
- Comparing and contrasting
- Debating

Key language

Vocabulary:

- Renewable, non-renewable, solar, geothermal, mantle, outer core, inner core, crust, geothermal, radioactive, tectonic plates, solar cells, solar heating panels, radiation, solar power tower, efficiency, specific heat capacity, steam, turbine

Co-funded by the Erasmus+ Programme of the European Union

The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Verb:

- To heat, to radiate

Language structure:

- Present simple active and passive
- Past simple active and passive
- Modals
- Clauses of contrast, addition and cause
- Linking words and expressions

Activities

Lesson 1 – Renewable and non-renewable energies – 1h

The teacher starts the lesson by asking the students the following questions: *Where did you get your power today to turn on the lights at home and at school, or in the vehicle by which you travelled to come to school?* Then the teacher writes on the board the words: *'fuels' and 'electricity',* and asks the students if they know what they are and where their sources are. After collecting the answers, the teacher tells the students that they are going to watch a video about renewable and non-renewable energies: https://youtu.be/US5oxo6Hkak - Renewable Energies: Part 1, and highlights the specific information the students have to look for as they watch the clip. From time to time the teacher uses the pause button and asks support questions that can help the students perform the task. After watching the video, the teacher asks the students to do the interactive exercise https://wordwall.net/resource/3220212/renewable-energy. In the end of the lesson, the students, with the teacher's help, design concept maps for renewable and non-renewable energies, taking into account their definitions, classifications, use, and problems that occur for each category: https://wordwall.net/resource/19312088/renewable-non-renewable-energies

Lesson 2 – Solar and geothermal energy – 1h

The lesson starts with an interactive exercise aiming at revising the knowledge and the specific vocabulary acquired in the previous lesson: https://wordwall.net/resource/3220205/renewable-energy. Then the teacher shows the students two pictures, one with solar panels and one of a geyser, and elicits the kind of energy they depict and whether they are renewable or non-renewable. Then the teacher divides the students into four groups and tells them that they are going to watch a video about the two main types of renewable energies and gives each groups the following assignments: Group A – solar energy: how it is produced, usage and characteristics, Group B – Solar energy: advantages and disadvantages, Group C: geothermal energy: how it is produced, usage and characteristics, and Group D – geothermal energy: advantages and disadvantages. While watching the video https://youtu.be/qg1YYj9N3aA - Renewable Energies: Part 2, from minute 5:52, the students in the four groups write down the information assigned to them, and then work collaboratively, in groups, to write a paragraph summarising the collected information. After the students finish writing the paragraphs, they present their work to their classmates.

The teacher divides the students into two main groups and tells them that they have to do research at home for the next lesson. One group must advocate for the geothermal energy, and the other for the solar energy so that they could have a debate. In order to do that, all the students must read the following articles https://www.paradisesolarenergy.com/blog/the-advantages-and-disadvantages-of-solar-energy and https://www.solarfeeds.com/mag/geothermal-energy-advantages-and-disadvantages/, as well as the resources from the Clil4Steam site: https://clil4steam.pixel-online.org/teaching-resources-sch.php?id_asch=116&section_asch=review and https://clil4steam.pixel-online.org/teaching-resources-sch.php?id_asch=117&section_asch=review They are encouraged to find other resources on the internet (articles or videos) which will help them support the debate.

Lesson 3 – Which is your superpower, solar or geothermal? -1 h

The teacher starts the lesson by explaining the students that each group has to write a resolution to support the renewable energy it has been assigned to them. They should use all the specific vocabulary they have acquired during the previous two lessons and during their research at home. Then one team present the resolution while the other team prepares arguments against it and vice versa. The teacher gives the students the guidelines to write their resolutions and for the grading process.

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Assessment FOR learning

- Teacher monitors group, pair and individual activities
- Students interact with partners (speaking creatively)
- Students participate in all tasks and activities
- Students work autonomously to do research and find justifications
- Students perform self and peer assessment
- Students use the specific vocabulary in a creative manner

Assessment OF learning

- Written resolutions for the debate

Material, resources, web tools

Video Lessons

- https://youtu.be/US5oxo6Hkak - Renewable Energies: Part 1
- https://youtu.be/qg1YYj9N3aA - Renewable Energies: Part 2

Created Teaching Resources

- https://clil4steam.pixel-online.org/teaching-resources-sch.php?id_asch=61&section_asch=creation

Reviewed Teaching Resources

- https://wordwall.net/resource/3220205/renewable-energy
- https://clil4steam.pixel-online.org/teaching-resources-sch.php?id_asch=116&section_asch=review
- https://clil4steam.pixel-online.org/teaching-resources-sch.php?id_asch=117&section_asch=review
- https://wordwall.net/resource/3220212/renewable-energy
- https://wordwall.net/resource/19312088/renewable-non-renewable-energies

Other Resources

- https://chariotenergy.com/chariot-university/geothermal-vs-solar/ - Geothermal vs. Solar Power Battle of the Green Energies
- https://www.paradisesolarenergy.com/blog/the-advantages-and-disadvantages-of-solar-energy
- https://www.solarfeeds.com/mag/geothermal-energy-advantages-and-disadvantages/
- https://wordwall.net/resource/19312088/renewable-non-renewable-energies

Materials:

- Board
- Handouts
- Concept maps
- Posters

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

CLIL for STEAM
Project Number: 2019-1-PL01- KA201-065027

The biogeochemical cycle of carbon

Teacher	Country	School
Diana Carino	Italy	IIS Montale Nuovo IPC

Students' Age	Subject	Topic	Students' target level of competence (CEFR)	Language Skills
16-17	• Biology	The biogeochemical cycle of carbon	B1	• Listening • Speaking • Reading • Interaction

Learning objectives (related to curriculum content)

Linguistic aims

- To improve language skills in L2
- To enrich scientific vocabulary
- To know how to move from one linguistic register to another.
- To produce clear and coherent texts in L2
- To summarize written texts

Subject specific aims

- To describe natural processes like photosynthesis and respiration as well as combustion and show how they are interlinked in the recycling of carbon in nature.
- To understand that the three interdependent processes, photosynthesis, breathing and combustion, are the basis of the displacement of the carbon between the living and non-living component of the biosphere..

Learning outcomes

Students will be able to:

- Observe, analyse and describe phenomena belonging to natural reality and to the aspects of daily life.
- Formulate hypotheses and verify them.
- Use simple schematizations and modelling.
- Acquire and understand information and know how to connect it.
- Face problematic situations.

Cognitive skills

The Following cognitive skills are developed: problem definition, cause/goal analysis, forecasting, creative thinking, idea evaluation.

Language Function

Comparing, describing, evaluating and explaining, hypothesizing, inquiring/questioning, planning and predicting, reporting.

Key language

Vocabulary:

- All the vocabulary in the glossary of the video lesson and of the interactive activities (created resources)

Co-funded by the Erasmus+ Programme of the European Union

Language structure:

- Present simple and present continuous tense; adverbs of frequency; future tenses (will, present continuous, to be going to); modal verbs for deductions (may, can't, must); If clauses 1st type; imperative form

Activities

Phase 1: -The biogeochemical cycle of carbon (Video lesson)
https://www.youtube.com/watch?v=MwcQ8rX80aM&ab_channel=CLIL4SteamProject
-Carbon cycle (Interactive activity)
https://learningapps.org/watch?v=pusee751521
These resources must be previously watched and read at home.
The teacher at school explains and comments about the resources and divides the class into small groups that will have to study and collect data about deforestation in a specific geographical area. In addition, they will have to produce a short report with personal suggestions to solve the problem or part of it. In the second meeting, after a brainstorming, data and possible solutions will be compared.
Finally, the students have to compare the answers of the interactive activity.

Phase 2: The Biogeochemical Cycle of Carbon. Photosynthesis. Videos
https://www.youtube.com/watch?v=KK6xLfEmo04
-Photosynthesis (Interactive activity)
https://wordwall.net/resource/3310166
These resources must be previously watched and read at home.
At school the teacher explains and comments on the resources, the teacher can interrupt the animation from time to time and have students explain the phenomenon by asking questions.
He explains the various slides also providing specific images related to the video but more explanatory.
At the end of the explanation, students must have primarily understood the importance of photosynthesis, of the autotrophic organisms that are at the base of the food chain; they must be able to explain the spectrum of action of chlorophyll and the function of the two photosystems; they must be able to explain the origin and the path that the electrons travel to reach the final acceptor; explain how ATP is produced in chloroplasts; analyse the fundamental phases of light dependent reactions and light independent reactions.
Then the students are divided into groups and invited to work on the topic.
In the next class meeting, each group, using both the material provided by the teacher and doing personal research, will involve the other groups through quizzes, crossword puzzles, discussions.
They must also discuss the interactive activity present in the resources

Phase 3: -The Biogeochemical Cycle of Carbon. Photosynthesis. – Web Site/Portal (lab)
http://www2.nau.edu/lrm22/lessons/photosynthesis/photosynthesis.html
This is an activity that allows students to do a simple qualitative and quantitative study of photosynthesis using disc-shaped pieces of leaves.
The teacher presents the activity explaining the various phases.
At the beginning some leaf discs, cut to measure, will be immersed in water. They will release oxygen as a result of photosynthesis and come to the surface. By measuring the elapsed time and the amount of floating discs it will be possible to calculate the reaction rate of photosynthesis. The teacher will explain that initially the leaf discs float in the water because the gases present in the mesophyll circulate freely in the large intercellular spaces.
Then these intercellular spaces are filled with a solution of sodium bicarbonate (NaHCO3) which increases the density of the leaf and, therefore, the discs sink.
Cells use bicarbonate ions for photosynthesis. Then the oxygen is released inside the leaf and the discs begin to float
Since cellular respiration, which consumes oxygen, occurs simultaneously, the rate at which the discs emerge is an indirect measure of the rate at which photosynthesis occurs.
After addressing the analysis of the resource with the teacher, the students are divided into small groups, each of which will be provided with the activity sheet. At the end of the experiment, the students will answer the questionnaire in the form and discuss about it

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Phase 4: Photosynthesis - Relationship between Photosynthesis and Cellular Respiration (Videos)
https://www.youtube.com/watch?v=SpuDDL6wOwc

-The Biogeochemical Cycle of Carbon. Cellular respiration. Videos
https://www.youtube.com/watch?v=ZYUdDjyNe3o
(Prerequisites: oxide reduction reactions)
These resources must be previously watched and read at home.
At school the teacher explains and comments on the resources, he can interrupt the animation from time to time and have students explain the phenomenon by asking questions.
He explains the various slides also providing specific images related to the video but more explanatory.
At the end of the explanation, students must be able to compare the energy gain resulting from complete oxidation of glucose and fermentation, to describe the role of ATP, NADH and FADH2 to summarize the process of glycolysis by highlighting the most important reactions and compounds, to explain the structure of the mitochondria, to describe how the formation of acetyl-Co A takes place, to analyse the main stages of the Krebs cycle, to summarize how NADH's high-energy electrons drop energy levels along the transport chain, to explain the fundamental role of oxygen at the end of the final electron transport, to describe the mechanisms that regulate chemosmotic processes
The teacher then divides the class into small groups that must make a list of the new terms learned and build a questionnaire, (of the type found in the interactive activities) to propose to the other groups, Kahoot can be used https://kahoot.com/.

Phase 5: Presentation of the work of the individual groups

Assessment FOR learning

In phases 1 to 5 the students are very active: they are asked to look for similar information on the web and to report about it to the class; they are asked to create questionnaires and quizzes and to take part in class discussions. So they need to focus on the three key-questions of "Assessment for learning": What do I know? What do I want to learn? What have I learnt? The production of a questionnaire, crosswords, quizzes, kahoot games could be useful to achieve awareness of the student's learning process. https://kahoot.com/

Assessment OF learning

Assessment of learning will be achieved at the end of the phases, after the students have been involved in their research. It will test the content of the learning module: natural processes like photosynthesis and respiration as well as combustion. Part of the final grade will test the use of the correct language structures (present simple and present continuous tense; adverbs of frequency; future tenses (will, present continuous, to be going to); modal verbs for deductions (may, can't, must); If clauses 1st type; imperative form). A short essay or report could be used for this purpose as it will allow the teacher to test both the content and the language.

Material, resources, web tools

Video lesson

- https://www.youtube.com/watch?v=MwcQ8rX80aM&ab_channel=CLIL4SteamProject

Created teaching resources

- https://learningapps.org/watch?v=pusee751521
- https://wordwall.net/resource/3310166

Reviewed teaching resources

- https://www.youtube.com/watch?v=KK6xLfEmo04
- http://www2.nau.edu/lrm22/lessons/photosynthesis/photosynthesis.html
- https://www.youtube.com/watch?v=SpuDDL6wOwc
- https://www.youtube.com/watch?v=ZYUdDjyNe3o

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Project Number: 2019-1-PL01- KA201-065027

The food chain

Teacher	Country	School
Vatavu Mihaela Mihaela Ciocan	Romania	EuroEd Secondary school, Vasile Alecsandri High school

Students' Age	Subject	Topic	Students' target level of competence (CEFR)	Language Skills
15-16	• Biology	Prey and predators	B1	• Listening • Speaking • Reading • Writing • Interaction

Learning objectives (related to curriculum content)

The aim of this learning scenario is to learn how the food is produced and consumed in the living organisms, and how important food chain is in the balance and preservation of life.

Learning outcomes

Students will be able to:

- Identify and differentiate a food chain from a food web
- Learn all the processes involved in the food chains and food webs
- Understand the factors that influence the food chains and food webs
- Learn and apply the useful vocabulary and language features to define how food webs and food chains work
- Describe orally how a food chain works
- Develop a food web for a particular habitat

Cognitive skills

- Listing food according to the source
- Matching specific words to their definitions
- Describing a food chain and a food web
- Finding out information about food chains and food webs
- Researching about food chains and food webs
- Analysing the role of food chains and food webs in the ecosystems
- Writing a specific piece of composition to sustain a point of view

Language Function

Language of defining and explaining

Key language

Vocabulary:

Ecosystem, inter-related, interdependent, organisms, environment, relationships, food chains, complex, food webs, predators, prey, predator, herbivore, carnivore, flesh, survive, scavenger, carcass, habitats, species, evolved, adaptation, prey, camouflage, nutrients, hunt, ambush, stalk, escape, signal, freeze, fluctuate, decline, variety, behaviour, adaptation, survive

Co-funded by the Erasmus+ Programme of the European Union

The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Verb:

- To prey, to transfer, to produce, to balance

Language structure:

- Present simple
- Passive voice – present
- Sequencers
- Modals (can, may, would)

Activities

Lesson 1 -The food chain – 1 h

Teacher starts the lesson by asking the students what they had eaten the previous evening. After they answer, the teacher asks them where they thought the food they had eaten comes from. Then the teacher elicits the origin of the food by asking the students to categorize the food according to three headings: *from the ground/ from plants/ from animals.* Then the teacher writes the following words on the board: *milk, yoghurt, cheese*, and asks the students what ingredient they have in common and where they come from. The teacher elicits the answer: *cows*. Then the teacher asks *What do cows eat?* After eliciting the answer, the teacher explains the students that *grass-cows-milk-dairy products* represent a food chain.
The teachers presents the students the video https://youtu.be/0Bf3gnwC7b4 about Predator and prey, and stops it from time to time to allow students answer the quiz questions of the video. After watching the video, for a better grasp of the new vocabulary and knowledge, the teacher shows the students the digital flashcards with the key terms of the video using the quizlet https://quizlet.com/588706887/food-chainfood-chain-flash-cards/ and elicits the answers from the students, showing them the definitions afterwards. Then the teacher asks the students to individually do the following exercise: https://wordwall.net/resource/3311849/clil4steam-predator-prey. The activity is a digital and interactive matching activity on the content of predator and prey. It is a matching exercise between terms and relevant definitions. The students will receive immediate feedback from the platform.

In the end of the lesson, the teacher divides students into four groups and asks them to work collaboratively by using definitions as prompts and asking questions so that they obtain the key term, as in Jeopardy show (*e.g. prompt: Meat eating animal that feeds on the remainder of dead animals. – Question: What is a scavenger?)*.

Lesson 2 – Food chains and food webs – 1 h

The teacher pairs up the students and asks them to complete a mind map with ideas and knowledge from the previous lesson. The students assess their peers' work. The students are then divided into four groups and each group is given a set of cards containing pictures of different food chains. The task is to create a food chain of their own using the pictures and then to present it to the whole class, using sequencers and passive voice in present tense (*e.g. First – primary producers, second – primary consumers; The primary producer is eaten by the primary producer etc.)*.
The teacher introduces the concept of food web by using a setting of a forest and drawing two food chains that are interdependent. Then the students watch the video https://www.youtube.com/watch?v=u0YC6pV1v4M - Ecological significance food chain and food web, which gives further information on the difference between food chains and food webs. After watching the video and in order to check their understanding, the teacher divides the class into groups of four learners, ABCD, and hands in each reader a section of a text previously separated into four sections, containing separate information about food chains and food webs. The students have to ask questions about the missing parts in their text and fill in the information.

In the end of the lesson, the teacher presents the class the assignment to be done for the last lesson of the unit: A project essay with the topic *Food chains and food webs and their role in the ecosystems.* For this, the teacher will supply students with the rubrics for the project: *What food chains and food webs are and how they work/ Why they are important for life preservation/ Why humans play an essential role in them*, and some worksheets as feedback with the most important vocabulary.

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Lesson 3 – Project essay – Home assignment presentation -3h
The students present their essays orally and the teacher acts as a guide and active observer during the class, asking questions, giving feedback and suggesting ideas.

Assessment FOR learning

- Teacher monitors group, pair and individual activities
- Students participate in all activities
- Students are autonomous learners
- Students do self and peer assessment

Assessment OF learning

Students write and present a project essay successfully.

Material, resources, web tools

Video Lessons

- https://youtu.be/0Bf3gnwC7b4 – Predator and prey

Created Teaching Resources

- https://clil4steam.pixel-online.org/tr_reviewed-sch.php?id_asch=193&section_asch=review

Reviewed Teaching Resources

- https://wordwall.net/resource/3311849/clil4steam-predator-prey
- https://www.britannica.com/plant/carnivorous-plant

Other Resources

- https://quizlet.com/588706887/food-chainfood-chain-flash-cards/
- https://www.youtube.com/watch?v=u0YC6pV1v4M - Ecological significance food chain and food web

Materials

- Worksheets
- Diagrams
- Texts

Co-funded by the Erasmus+ Programme of the European Union

The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

CLIL for STEAM
Project Number: 2019-1-PL01- KA201-065027

The Greenhouse effect and global warming

Teacher	Country	School
Diana Carino	Italy	IIS Montale Nuovo IPC

Students' Age	Subject	Topic	Students' target level of competence (CEFR)	Language Skills
16-17	• Biology	The greenhouse effect and global warming	B1	• Listening • Speaking • Reading • Interaction

Learning objectives (related to curriculum content)

Linguistic aims

- To improve language skills in L2
- To enrich scientific vocabulary
- To know how to move from one linguistic register to another.
- To produce clear and coherent texts in L2
- To summarize written texts

Subject specific aims

To understand the reasons at the origin of global warming

Learning outcomes

Students will be able to:

- Observe, analyse and describe phenomena belonging to natural reality and to the aspects of daily life.
- Formulate hypotheses and verify them.
- Use simple schematizations and modelling.
- Acquire and understand information and know how to connect it.
- Face problematic situations.

Cognitive skills

The students will develop a sensible and concrete awareness regarding global issues, about the development and conservation of life on our planet, the greenhouse effect, climate change and its disastrous effects both for fauna and, especially, for vegetation.

The following cognitive skills are developed: problem definition, cause/goal analysis, forecasting, creative thinking, idea evaluation.

Language Function

Comparing, describing, evaluating and explaining, hypothesizing, inquiring/questioning, planning and predicting, reporting.

Key language

Vocabulary:

- All the vocabulary in the glossary of the video lesson and of the interactive activities (created resources)

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Language structure:

- Present simple and present continuous tense; adverbs of frequency; future tenses (will, present continuous, to be going to); modal verbs for deductions (may, can't, must); If clauses 1st type; imperative form

Activities

Phase 1:

- The biogeochemical cycle of carbon. The greenhouse effect and human artificial activities. (Web site/Portal)
https://www.climatecouncil.org.au/deforestation/

-Global warming (Interactive activity)
https://wordwall.net/resource/15357503

These resources must be previously watched and read at home.
The teacher at school explains and comments about the resources and divides the class into small groups that will have to study and collect data about deforestation in a specific geographical area. In addition, they will have to produce a short report with personal suggestions to solve the problem or part of it. In the second meeting, after a brainstorming, data and possible solutions will be compared.
Finally, the students have to compare the answers of the interactive activity.

Phase 2:

-The Greenhouse effect (Video lesson)
https://www.youtube.com/watch?v=_Fq7HTY2r7M&ab_channel=CLIL4SteamProject

-The Biogeochemical Cycle of Carbon. Greenhouse effect 2 (Web site/Portal)
https://www.livescience.com/37743-greenhouse-effect.html

-The Greenhouse Effect: An Investigation (Interactive activity)
These resources must be previously watched and read at home
After a brief introduction relating to the presentation of these resources, the teacher divides the class into small groups that must read, understand and produce two schemes on the subject. In the first scheme, the thermal
balance of the Earth must be highlighted, in the second, the changes in CO_2 concentrations emitted into the atmosphere since 1800 to today must be analysed. For this second scheme, students must integrate the examined resource with a personal research and build the related chart. They then have to compare their data with the other groups and start a comparison and discussion on the issue. At home students can have fun with "The Greenhouse Effect: An Investigation"

Phase 3: The teacher divides the class into small groups that must make a list of the new terms learned and build a questionnaire, (of the type found in the interactive activities) to propose to the other groups, Kahoot can be used.
https://kahoot.com/
Presentation of the work of the individual groups.

Assessment FOR learning

In phases 1 to 3 the students are very active: they are asked to look for similar information on the web and to report about it to the class; they are asked to create questionnaires and quizzes and to take part in class discussions. So they need to focus on the three key-questions of "Assessment for learning": What do I know? What do I want to learn? What have I learnt? The production of a questionnaire, crosswords, quizzes, kahoot games could be useful to achieve awareness of the student's learning process.

Assessment OF learning

Assessment of learning will be achieved at the end of the phases, after the students have been involved in their research. It will test the content of the learning module: the greenhouse effect and global warming. Part of the final grade will test the use of the correct language structures (present simple and present continuous tense; adverbs of frequency; future tenses (will, present continuous, to be going to); modal verbs for deductions (may, can't, must); If clauses 1st type; imperative form). A short essay or report could be used for this purpose as it will allow the teacher to test both the content and the language.

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Project Number: 2019-1-PL01- KA201-065027

Material, resources, web tools

Video lesson

- https://www.youtube.com/watch?v=_Fq7HTY2r7M&ab_channel=CLIL4SteamProject

Created teaching resources

- https://wordwall.net/resource/15357503
- https://clil4steam.pixel-online.org/tr_created-sch.php?id_asch=60&section_asch=creation

Reviewed teaching resources

- https://www.climatecouncil.org.au/deforestation/
- https://www.livescience.com/37743-greenhouse-effect.html

Co-funded by the Erasmus+ Programme of the European Union

The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Project Number: 2019-1-PL01- KA201-065027

The law of refraction and reflection of light

Teacher	Country	School
Marcin Paśnikowski Agata Ziętek	Poland	Szkoła Podstawowa nr 5 im. Janusza Kusocińskiego w Świdniku

Students' Age	Subject	Topic	Students' target level of competence (CEFR)	Language Skills
13-15	• Physics	Refraction and reflection of light	A2 B1	• Listening • Speaking • Reading • Writing • Interaction

Learning objectives (related to curriculum content)

After completing this lesson, students will be able to:

- Define the law of refraction, reflection and scattering of light,
- Describe the course of rays in each phenomenon
- Constructively draw rays in individual cases,
- Use the concept of shadow and penumbra;
- Learn the key vocabulary of the English language

Learning outcomes

Students will be able to apply the law of refraction and reflection of light in the experiment and phenomena from everyday life and will be able to distinguish the phenomenon of light scattering on different surfaces.

Cognitive skills

Students will develop self-motivation, problem-solving skills, independent learning and observation of these phenomena in life. They will improve their persistent, selective, divided attention, long-term memory, logic and reasoning.

Language Function

Students will be able to explain the phenomenon of refraction and reflection of light and its practical application. Students will learn to hypothesize, describe, analyze, summarize and draw conclusions.

Key language

Vocabulary:

- Mirror, refraction, reflection and refraction, normal, perpendicular line, incident ray, reflected and refracted ray, refractive index, scattering.

Verb:

- Solve, define, experiment, prove, apply, define, draw

Language structure:

- Present simple; basic English vocabulary with a combination of physical and technical terms.

Co-funded by the Erasmus+ Programme of the European Union

The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Activities

92) Introduction of the topic and vocabulary related to the topic.
93) Demonstration of a video lesson.
94) The film is paused several times so that students have time to reflect, ask questions, and participate in discussions.
95) While viewing the video, students are encouraged to write down the words they want to learn.
96) Demonstration of the experiment of obtaining the phenomenon of reflection, scattering and refraction of light. (change of the angle of incidence of the incident beam)
97) Working individually, students apply the laws and principles in various tasks.
98) Working in small groups, students compare the results and explain their solutions.
99) The teacher monitors the students' work and provides the necessary support when needed.
100) The teacher asks students to reflect on what they have learned in the lesson and summarizes the lesson.
101) The teacher suggests watching a film about the refraction and absorption of light to develop information on the use of these phenomena in human life.

Assessment FOR learning

The teacher will ask students questions and provide feedback, helping students understand what it is like to be successful in each assignment (for example, making a hypothesis from experience, solving problems).

Assessment OF learning

Students will be assessed at the end of the unit by passing a test and an oral answer regarding the analysis of phenomena and their applications in our lives.

Material, resources, web tools

Video Lessons

- https://www.youtube.com/watch?v=EZIWPXTHIUs
- https://www.youtube.com/watch?v=gDA_nDXM-ck
- https://www.youtube.com/watch?v=SeaWCamCHWQ
- https://www.youtube.com/watch?v=euuAHjhDO6I

Created Teaching Resources

- https://clil4steam.pixel-online.org/teaching-resources-sch.php?id_asch=66&section_asch=creation

Other Recources

- https://wordwall.net/resource/10136512/reflection-refraction-1
- https://keydifferences.com/difference-between-reflection-and-refraction.html
- https://wordwall.net/resource/10137276/reflection-refraction-2

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

CLIL for STEAM
Project Number: 2019-1-PL01- KA201-065027

The triangles in our lives

Teacher	Country	School
Elza Gheorghiu Gheorghita Nistor	Romania	EuroEd Secondary School, Vasile Alecsandri High School

Students' Age	Subject	Topic	Students' target level of competence (CEFR)	Language Skills
13-14	• Math	The Pythagorean Theorem	A2 B1	• Listening • Speaking • Reading • Writing • Interaction

Learning objectives (related to curriculum content)

The aim of this learning scenario is to learn about arguably the most important theorem in Geometry, the Pythagorean Theorem and to explore applications and uses for this fundamental theorem in everyday life.

Learning outcomes

Students will be able to:

- Define the Pythagorean theorem
- Solve equations using the Pythagorean Theorem
- Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions
- Use the Pythagorean theorem to solve real world problems
- Complete assignments by following directions

Cognitive skills

- Identifying right angle triangles
- Labelling the sides of a right angle triangle
- Identifying the missing words in a listening
- Drawing different types of triangles
- Calculating the unknown lengths of a right angle tringle sides
- Applying the Pythagorean theorem to determine if a triangle is a right angle one
- Assessing peer work
- Experimenting the theorem

Language Function

- Asking questions
- Analysing a real situation
- Comparing and contrasting
- Instructing

Key language

Vocabulary:

- Hypotenuse, triangle, angle, right-angle triangle, square root, leg, side, equation, formula, equiangular

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Verb:

- To solve, to calculate, to extract

Language structure:

- Wh Questions
- Past Simple
- Adjectives and comparatives

Activities

Lesson 1 – The Pythagorean Theorem and the history behind it – 1h

The teacher starts the lesson showing the students a cartoon https://i.redd.it/4mcn3xzo3n751.png and elicits the topic of the lesson. The students already have previous knowledge about the Pythagorean Theorem, but in their mother tongue.

The teacher asks the students what they know about Pythagoras and about the theorem named after him. After collecting different answers, the teacher explains to the students that they are going to watch a video about the history behind the Pythagorean Theorem: https://www.youtube.com/watch?v=1QZ7xsCqREM, and gives each student a handout containing facts from the video (e.g. *He was born in 500 BC. – When was Pythagoras born?)*. After watching the clip the students will have to make questions for the given sentences using Past Tense Simple and Wh-Questions. After the students finish the task, the teacher pairs them up and ask them to do peer assessment of their work.

The teacher draws a right angle triangle on the board and labels its sides. Then writes the most important key words related to the Pythagorean Theorem on the board: *leg, hypotenuse, squared, ratio, multiplied, equiangular.* Then the teacher presents the students the video resource https://youtu.be/zneVVzZfZA4 - Pythagorean Theorem part 1, which contains all the explanations related to the theorem and the two proofs of it. While watching, the teacher will stop the video from time to time to highlight the words previously written on the board, to allow students to write them down in their notebooks, along with the translations in their mother tongue. After watching the video, the teacher pairs up the students and gives them a handout with gapped lyrics of the Pythagorean Theorem (Math Song): https://clilstore.eu/wordlink/?navsize=1&sl=en&url=https://clilstore.eu/clilstore/page.php?id=5322{and}hl=en and asks them to fill in the gaps while watching and listening to the song. In this way the students practice the new specific vocabulary in an entertaining manner.

For the next lesson, as home assignment, the teacher asks the students to observe the environment and to notice where they see right angle triangles for which they can apply the Pythagorean Theorem and asks them to watch https://youtu.be/vDS__6dXu4g - Pythagorean Theorem Part 2 at home, to see how they can apply the Pythagorean Theorem.

Lesson 2 – The Pythagorean Theorem in the real world – 1h

In the beginning of the lesson the teacher checks students' assignments and then chooses one of the examples, asking the students if they know how to solve the unknown lengths of the sides in that specific right angle triangle. Then the teacher divides the students in groups of four and gives each group a printed copy of Understanding the Pythagorean theorem - https://pythagoras.nu/. The students must study the material and discuss the basic examples where Pythagoras theorem is used and the advanced examples. Each group is assigned one example and after working collaboratively within the group, they have to present their study in front of the class, using the specific vocabulary. Then, in the same groups, the students are given questions to answer: https://clil4steam.pixel-online.org/teaching-resources-sch.php?id_asch=149&section_asch=review. There is a set time and the students must solve as many problems as possible. The first seven questions are awarded one point. The next five are awarded three points. The task has a double aim: to make students more confident in their math skills and understanding of the theorem, and to make them practice the specific vocabulary while solving a math problem. The group who succeeds in answering the most questions and gaining the most points in the set time wins.

The teacher gives students an assignment for home: https://www.mathopolis.com/questions/quiz.php .

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Lesson 3 – Pythagorean Theorem escape room -1 h
The teacher checks the assignment and gives explanations if necessary.

The teacher explains the students that they are going to be part of an interesting activity, called The Pythagorean Theorem Escape Room. The students are divided in four groups, each of the groups being locked in a secret room. The students are given a list of questions using the Pythagorean Theorem. Each correct answer, representing a number, has to be used on a passcode decoder, and after finding all the passcodes, the students are free. The students work collaboratively and they have to use English in their conversation within the groups. The teacher goes from one group to another and gives guidance to the students.

The following are the guidelines for the escape room: each group of students have access to a computer, a phone or a tablet. They will find the problems to solve at this link: https://wordwall.net/resource/19309183/pythagorean-escape-room. It is important to flip each card to see the number of the problem and to write the results in order. After solving the 7 problems, they will have to use the results and for each to find the correspondent letter of the English alphabet (*e.g. A is 1, B is 2, Z is 26)*. If one of the results is larger than 26, they will have to add the digits until they obtain a number less than 26 (*e.g. if the result is 85, the correspondent letter will be 8+5=13 – letter M)*. After they finish they must obtain the passcode NHJEMXD, which will set them free. The teacher monitors each group and checks the correct passcode.

Assessment FOR learning

- Teacher monitors group, pair and individual activities
- Students participate in all tasks and activities
- Students interact with a partner (speaking creatively)
- Students solve problems
- Students do self and peer assessment

Assessment OF learning

- Students solve all the problems on the handout

Material, resources, web tools

Video Lessons

- https://youtu.be/zneVVzZfZA4 - Pythagorean Theorem part 1
- https://youtu.be/vDS__6dXu4g - Pythagorean Theorem Part 2

Reviewed Teaching Resources

- https://clil4steam.pixel-online.org/teaching-resources-sch.php?id_asch=41&section_asch=review

Other Resources

- https://i.redd.it/4mcn3xzo3n751.png
- https://clilstore.eu/wordlink/?navsize=1&sl=en&url=https://clilstore.eu/clilstore/page.php?id=5322{and}hl=en – a song to listen and fill in the gaps to practice the vocabulary in a fun way
- https://www.mathopolis.com/questions/quiz.php
- https://pythagoras.nu/
- https://www.youtube.com/watch?v=1QZ7xsCqREM - Brief History of the Pythagorean Theorem
- https://sciencing.com/use-trigonometry-architecture-6631509.html - article - application of the theorem in the real world
- https://www.youtube.com/watch?v=Gw9iKERLonc - Real life Applications of the Pythagorean Theorem
- https://wordwall.net/resource/19309183/pythagorean-escape-room

Materials

- Handouts
- Board
- flashcards

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

CLIL for STEAM
Project Number: 2019-1-PL01- KA201-065027

Tricks of the light: mirages (1)

Teacher	Country	School
Annalisa Bassi	Italy	IIS Montale Nuovo IPC

Students' Age	Subject	Topic	Students' target level of competence (CEFR)	Language Skills
16-17	• Physics	Mirages	B1	• Listening • Speaking • Reading • Interaction

Learning objectives (related to curriculum content)

The linguistic objectives are to teach students a correct scientific language and to give them the necessary instruments to be able to read and study a scientific article, to be able to watch and understand a video about mirages
The specific objectives are to stimulate the curiosity of the students in order to introduce: the two laws of physics: refraction and reflection of light, the composition of the solar light as a sum of electromagnetic waves with different frequencies, light as a minimal part of electromagnetic waves: from radio waves to gamma rays.

Learning outcomes

Students will be able to: observe, compare and make assumption or theories about the phenomenon of mirages.

Cognitive skills

To develop the observation skills and the ability to make connections and suppositions. To be able to be engaged in team work. To acquire and interpret information in a critical way through different contexts and through different communicative instruments.
To estimate the scientific credibility of the source and to discern the difference between facts and opinions

Language Function

- Classifying
- Comparing
- Describing
- Evaluating and Explaining
- Hypothesizing
- Inquiring/Questioning
- Reporting

Key language

Vocabulary:

- All the vocabulary in the glossary in the Created Teaching resource Tricks of the light 2: Mirages

Language structure:

- present simple and present continuous tense; adverbs of frequency; future tenses (will, present continuous, to be going to); modal verbs for deductions (may, can't, must); If clauses 1st type; imperative form

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Activities

Phase 1: After watching the videoUnusual Superior Mirage [Fata Morgana] on Lake Erie https://www.youtube.com/watch?v=hE75wriAi6I&feature=youtu.be, the teacher must explain and help the students to recognise that these phenomena are a consequence of the refraction and reflection of the light. Hecan use other videos or asks students to search about these topics. Itis important that the students can estimate the scientific credibility of the sources and identify the photoshopped images. Often the students recognize that the inferior mirage is not so unusual and remember that they have seen it on the road in summer.
The teacher must leadthe students to formulate some theories about this phenomenon.At the end ofphase 1 the teacher will sum up the essential characteristics whymirages can appear in the sky: the position of the observer, the position of the sun , the presence of water. The teacher will explain the laws of physics responsible for mirages.

Phase 2: Fata Morgana: Mirages (video) https://www.youtube.com/watch?v=maLRhoceeuc
Same steps as in phase 1
the video is very charming and appealing and the students are stimulated to find other on line pictures, videos , and so on. In this way the refraction and reflections are connected to mirages or other optic phenomena and so the students cannot forget these laws.

Phase 3: homework. The students watch the videos Tricks of the Light 2 :Mirages https://www.youtube.com/watch?v=TlexLNla7Xc&t=1s&ab_channel=CLIL4SteamProject. The students can then look for other interesting material on the internet and report about it to the class.

Assessment FOR learning

In phase3 the students are very active: they are asked to look for similar information on the web and to report about it to the class. So they need to focus on the three key-questions of “Assessment for learning” : What do I know? What do I want to learn? What have I learnt? The production of a Portfolio or an Oral Presentation could be useful to achieve awareness of the student’s learning process.

Assessment OF learning

Assessment of learning will be achieved at the end of the phases, after the students have been involved in their research. It will test the content of the learning module: the two laws of physics: refraction and reflection of light, the composition of the solar light as a sum of electromagnetic waves with different frequencies, the light as a minimal part of electromagnetic waves: from radio waves to gamma rays. Part of the final grade will test the use of the correct language structures (present simple and present continuous tense; adverbs of frequency; future tenses (will, present continuous, to be going to); modal verbs for deductions (may, can’t, must); If clauses 1st type; imperative form). A short essay or report could be used for this purpose as it will allow the teacher to test both the content and the language.

Material, resources, web tools

Video lesson

- https://www.youtube.com/watch?v=TlexLNla7Xc&t=1s&ab_channel=CLIL4SteamProject

Created teaching resources

- https://wordwall.net/resource/3206953

Reviewed teaching resources

- https://www.youtube.com/watch?v=hE75wriAi6I&feature=youtu.be
- https://www.youtube.com/watch?v=maLRhoceeuc

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Project Number: 2019-1-PL01- KA201-065027

Tricks of the Light: Mirages (2)

Teacher	Country	School
Andrius Storta	Lithuania	Trakų Vytauto Didžiojo gimnazija

Students' Age	Subject	Topic	Students' target level of competence (CEFR)	Language Skills
16-18	• Physics	Mirages	B1 B2	• Listening • Speaking • Reading • Writing • Interaction

Learning objectives (related to curriculum content)

The aim of this learning scenario is to:

- Introduce the phenomenon to the students;
- Introduce the laws of physics – refraction, reflection and light scattering;
- Reproduce a mirage in the classroom;

Learning outcomes

Students will be able to:

- Explain how mirages are formed;
- Describe types of mirages;
- Explain the laws of physics – refraction, reflection and light scattering;
- Provide solutions to the problem of global warming;
- Conduct an experiment in class to produce a mirage effect.

Cognitive skills

Students will develop note-taking, communication skills, self-motivation, critical thinking skills, and problem-solving skills.

Language Function

Students will be able to use the language to describe and explain the topic. Students will learn to analyze, compare, contrast, summarize and draw conclusions.

Key language

Vocabulary:

- Refraction, reflection, incident ray, angle of incidence, angle of reflection, index of refraction, mirage, inferior mirage, superior mirage, Fata Morgana, light scattering, inversion, solution.

Verb:

- Appear, bend, reflect, collide, approach, disappear, distorted, deflect

Language structure:

- Present simple, present continuous

Co-funded by the Erasmus+ Programme of the European Union

The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Activities

65. Introducing the topic and topic-related vocabulary.
66. Demonstrating the video lesson.
67. The video lesson is paused when the teacher wants to ask questions and make sure that students understand the content.
68. Students work individually with Word Unscramble to improve their reading skills and practice new vocabulary.
69. Working in pairs, students exchange information they remember from the video lesson.
70. The teacher asks students to answer the questions about mirages and encourages other students to comment on the answers.
71. The teacher asks students to reflect on what they have learned in the lesson and summarizes the lesson.

Assessment FOR learning

The teacher will question the students and will provide the feedback with this way helping students to understand what successful work looks like for each task they are doing (for example – summarizing the content in the video, describing the diagram).

Assessment OF learning

Students will be assessed at the end of the unit. They will have to answer questions, solve problems, complete a presentation or write essays/reports according to the requirements of the national curriculum.

Material, resources, web tools

Video lesson

- https://clil4steam.pixel-online.org/video-library-sch.php?id_asch=29

Created teaching resources

- https://clil4steam.pixel-online.org/tr_created-sch.php?id_asch=46&section_asch=creation
- https://clil4steam.pixel-online.org/tr_created-sch.php?id_asch=106&section_asch=creation
- https://clil4steam.pixel-online.org/tr_created-sch.php?id_asch=57&section_asch=creation

Reviewed teaching resources

- https://www.farmersalmanac.com/fata-morgana-mirage-28630
- https://astronomy.com/magazine/stephen-omeara/2014/05/the-bewitching-fata-morgana
- https://www.youtube.com/watch?v=maLRhoceeuc&ab_channel=IlManfre

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

CLIL for STEAM
Project Number: 2019-1-PL01- KA201-065027

Tricks of the light: rainbows (1)

Teacher	Country	School
Annalisa Bassi	Italy	IIS Montale Nuovo IPC

Students' Age	Subject	Topic	Students' target level of competence (CEFR)	Language Skills
16-17	• Physics	Rainbows	B1	• Listening • Speaking • Reading • Interaction

Learning objectives (related to curriculum content)

The linguistic objectives are to teach students a correct scientific language and to give them the necessary instruments to be able to read and study a scientific article, to be able to watch and understand a video about rainbows.
The specific objectives are to stimulate the curiosity of the students in order to introduce: the two laws of physics: refraction and reflection of light, the composition of the solar light as a sum of electromagnetic waves with different frequencies, light as a minimal part of electromagnetic waves: from radio waves to gamma rays.

Learning outcomes

Students will be able to: observe, compare and make assumption or theories about the rainbow phenomenon.

Cognitive skills

To develop the observation skills and the ability to make connections and suppositions. To be able to be engaged in team work. To acquire and interpret information in a critical way through different contexts and through different communicative instruments.
To estimate the scientific credibility of the source and to discern the difference between facts and opinions.

Language Function

- Comparing
- Describing
- Evaluating and Explaining
- Hypothesizing
- Inferring
- Inquiring/Questioning

Key language

Vocabulary:

All the vocabulary in the glossary in the Created Teaching resource Tricks of the light: Rainbows

Language structure:

- Present simple and present continuous tense; adverbs of frequency; future tenses (will, present continuous, to be going to); modal verbs for deductions (may, can't, must); If clauses 1st type; imperative form

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Activities

Phase 1: The rainbow: a natural phenomenon (slides)
https://www.youtube.com/watch?v=abz5gRwZptU
These slides may be used as an introduction in a lesson about the light. Starting with the observation of fine images is a good way to catch the attention of the students. At first the students must only listen and watch the slides.Then the teacher will ask questions to understand if the students have seen any analogy in the pictures they have watched.
The teacher must help the students to focus on these analogies andhe must lead them to formulate the same theories about this phenomenon. At the end of the lesson the teacher will sum up the essential characteristics why the rainbow can appear in the sky: the position of the observer, the position of the sun , the presence of water.

Phase 2: The science of rainbows (video)
https://www.youtube.com/watch?v=5pYnC-ONdXQ
This video is a simple and amusing way to explain the rainbow phenomenon
as an application of physical laws.
If the teacher has previously had some lessons about the waves (elastic waves) and he has already explained the characteristics: period, wavelength, frequency, speed, and so on, he can use this video to introduce the light as a particular wave (sum of electromagnetic waves) and see that this wave acts like the other waves. It is easier to explain the refraction and reflexion laws using the light because students can see and verify these easily. The teacher can explain the two laws and then make a connection with elastic waves.

Phase 3: How rainbows form (video)
https://www.youtube.com/watch?v=xkDhQGXqwCM
The teacher must ask questions to the students about the parts of the video which are less complete (for example: why is the form of the rainbow an arc?) and he must stimulate them to ask other questions. Then he must lead them to the explanation, including research on line. He must complete the video with clarifications and in depth information. He can also tell the history of the rainbow starting from Alessandro di Afrodisia, Aristotele, Cartesio to nowadays

Phase 4: homework. The students watch the videos Tricks of the Light 1 : Rainbows .
https://www.youtube.com/watch?v=YGuytw5Ry20&t=28s&ab_channel=CLIL4SteamProject
The students can then look for other interesting material on the internet and report about it to the class.

Phase 5 : How to make a rainbow: simple science experiment (online lab)
https://www.youtube.com/watch?v=xkDhQGXqwCM
After watching the on line lab, the teacher must help the students to work in groups to reproduce that phenomenon in class. Then he asks the teams to look for other online similar resources for homework. Every group must look for a specific topic (refraction of the light in two medium or total refraction or scattering....) and they must reproduce these experiments in class.

Phase 6: Homework Tricks of Light 1: script and glossary. And Tricks of the light: unscrambled.
The students read the script and revise the vocabulary

Assessment FOR learning

In phases 3 to 5 the students are very active: they are asked to look for similar information on the web and to report about it to the class. So they need to focus on the three key-questions of “Assessment for learning”: What do I know? What do I want to learn? What have I learnt? The production of a Portfolio or an Oral Presentation could be useful to achieve awareness of the student’s learning process.

Assessment OF learning

Assessment of learning will be achieved at the end of the phases, after the students have been involved in their research. It will test the content of the learning module: the two laws of physics: refraction and reflection of light, the composition of the solar light as a sum of electromagnetic waves with different frequencies, the light as a minimal part of electromagnetic waves: from radio waves to gamma rays. Part of the final grade will test the use of the correct language structures (present simple and present continuous tense; adverbs of frequency; future tenses (will, present continuous, to be going to); modal

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

verbs for deductions (may, can't, must); If clauses 1st type; imperative form). A short essay or report could be used for this purpose as it will allow the teacher to test both the content and the language.

Material, resources, web tools

Video lesson

- https://www.youtube.com/watch?v=YGuytw5Ry20&t=28s&ab_channel=CLIL4SteamProject

Created teaching resources

- https://clil4steam.pixel-online.org/tr_created-sch.php?id_asch=45&section_asch=creation
- https://www.youtube.com/watch?v=YGuytw5Ry20&t=28s&ab_channel=CLIL4SteamProject

Reviewed teaching resources

- https://www.youtube.com/watch?v=abz5gRwZptU
- https://www.youtube.com/watch?v=5pYnC-ONdXQ
- https://www.youtube.com/watch?v=xkDhQGXqwCM
- https://www.youtube.com/watch?v=xkDhQGXqwCM

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Project Number: 2019-1-PL01- KA201-065027

Tricks of the Light: Rainbows (2)

Teacher	Country	School
Andrius Storta	Lithuania	Trakų Vytauto Didžiojo gimnazija

Students' Age	Subject	Topic	Students' target level of competence (CEFR)	Language Skills
16-18	• Math	Tricks of the Light: Rainbows	B1 B2	• Listening • Speaking • Reading • Writing • Interaction

Learning objectives (related to curriculum content)

The objectives of this learning scenario are to introduce and explain formations of rainbows, demonstrate how rainbows can be created in the classroom/at home, and to introduce refraction and reflection of light, the composition of the solar light as the sum of electromagnetic waves with different frequencies.

Learning outcomes

Students will be able to:

- Describe the phenomena;
- Explain formations of rainbows;
- Create a rainbow in the classroom.

Cognitive skills

Students will develop self-motivation, self-directed and independent learning skills as well as observation and critical thinking skills.

Language Function

In this lesson, students will use the language to describe and explain the phenomena. They will be able to compare, make assumptions about the rainbow phenomena.

Key language

Vocabulary:

- Reflection, refraction, dispersion of light, light scattering, rainbow, droplet of water, spectrum of light, range of wavelengths, sensitive, effect, meteorological phenomenon, multicolored, circular, arch, mnemonic, airborne water, mist, spray, dense, primary rainbow

Verb:

- Bend, reflect, refract, split, caused by, rotate, adjust

Language structure:

- Present simple, conditional sentences

Activities

72. Introducing the topic and topic-related vocabulary.
73. Demonstrating the video lesson.
74. The video is paused several times so that students have some time to think, ask questions, participate in the discussion.
75. During the review of the video the students are encouraged to write down the words that they want to learn.

Co-funded by the Erasmus+ Programme of the European Union

The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

76. Working in pairs, students practice describing the phenomena.
77. Working in small groups, students create a rainbow in the classroom. They are able to explain the process of creating a rainbow.
78. The teacher monitors the students' work and provides the necessary support when needed.
79. The teacher asks students to reflect on what they have learned in the lesson and summarizes the lesson.

Assessment FOR learning

The teacher will question the students and provide feedback in this way, helping the students to understand what the successful work looks like in each task (for example, explaining the experiment).

Assessment OF learning

Students will be assessed at the end of the unit. They will have to answer questions, solve problems, complete a presentation or write essays/reports according to the requirements of the national curriculum.

Material, resources, web tools

Video lesson

- https://clil4steam.pixel-online.org/video-library-sch.php?id_asch=28

Created teaching resources

- https://clil4steam.pixel-online.org/tr_created-sch.php?id_asch=45&section_asch=creation
- https://clil4steam.pixel-online.org/tr_created-sch.php?id_asch=57&section_asch=creation

Reviewed teaching resources

- https://clil4steam.pixel-online.org/tr_reviewed-sch.php?id_asch=205&section_asch=review
- https://clil4steam.pixel-online.org/tr_reviewed-sch.php?id_asch=64&section_asch=review
- https://clil4steam.pixel-online.org/tr_reviewed-sch.php?id_asch=67&section_asch=review
- https://clil4steam.pixel-online.org/tr_reviewed-sch.php?id_asch=89&section_asch=review
- https://clil4steam.pixel-online.org/tr_created-sch.php?id_asch=45&section_asch=creation

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Project Number: 2019-1-PL01- KA201-065027

What is Photosynthesis?

Teacher	Country	School
Loreta Krinickienė	Lithuania	Trakų Vytauto Didžiojo gimnazija

Students' Age	Subject	Topic	Students' target level of competence (CEFR)	Language Skills
16-18	• Biology	Photosynthesis	B1 B2	• Listening • Speaking • Reading • Writing • Interaction

Learning objectives (related to curriculum content)

After applying this learning scenario, students will be able to describe the process of photosynthesis and explain how essential it is for conversion of energy to food; to explain the basic formula for photosynthesis.

Learning outcomes

Students will be able to explain the process of photosynthesis and the role of the green plants in production of nutrients. Students will acquire the basic English vocabulary related to Photosynthesis and will be able to explain the phenomenon in English.

Cognitive skills

Students will develop self-motivation, note-taking, analytical thinking and problem solving skills.

Language Function

Students will be able to explain the process of photosynthesis and the role of the green plants in production of nutrients.
Students will learn to describe, analyze, summarize and draw conclusions.

Key language

Vocabulary:

- Energy, food chains, synthesis, photosynthesis, photo, producer, consumer, water, carbon dioxide, sunlight, limiting factors, sugars stomata, vessels, stem, cells, chloroplasts, detergent, chlorophyll, hydrogen, oxygen, starch, fibers.

Verb:

- Synthesise, produce, convert, trap, provide.

Language structure:

- Present simple tense, conditional sentences, modal verbs.

Activities

80. Introducing the topic and topic-related vocabulary.
81. Demonstrating the video lesson.
82. The video lesson is paused when the teacher wants to ask questions and make sure that students understand the content.
83. Students are provided some time to work individually with the Word wall to improve their reading skills and practice new vocabulary.
84. Demonstration of the Floating Leaf Discs Lab experiment and carrying out the experiment working in groups.

Co-funded by the Erasmus+ Programme of the European Union

The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

85. The video is paused and students are asked to answer the question why the leaves start floating when they are in the light condition.
86. After listening to several explanations, teacher plays the video and invites students to find out the answer.
87. The teacher asks students to reflect on what they have learned in the lesson and summarizes the lesson.

For their homework, students are assigned to answer the questions:

1. How does the suction help the leaf disks to sink?
2. How does the detergent help the leaf disks to sink?
3. Why don't the leaf disks soaking in the water (control) float?
4. What is the purpose of the baking soda solution?
5. What is the purpose of the light reaction?
6. Why do the leaf disks in the baking soda solution (treatment) begin to float?
7. Why do the leaves begin to sink again in the dark?
8. Why don't the leaves in the baking soda solution continue to produce oxygen in the dark?
9. Why do we use the half-way mark as a point of comparison rather than the point at which all the disks are floating?
10. If the light-independent reaction can run without light, why does oxygen production (and presumably glucose production) stop?

Students are encouraged to use the project resources to answer the questions.

Assessment FOR learning

The teacher will question the students and provide the feedback in this way, helping the students to understand what successful work looks like in each task (for example, describing and explaining the experiment, answering the questions).

Assessment OF learning

Students will be assessed at the end of the unit. They will have to answer questions, solve problems, complete a presentation or write essays/reports according to the requirements of the national curriculum.

Material, resources, web tools

Video lesson

- https://clil4steam.pixel-online.org/video-library-sch.php?id_asch=20

Created teaching resources

- https://clil4steam.pixel-online.org/tr_created-sch.php?id_asch=25&section_asch=creation
- https://clil4steam.pixel-online.org/tr_created-sch.php?id_asch=38&section_asch=creation
- https://clil4steam.pixel-online.org/tr_created-sch.php?id_asch=72&section_asch=creation
- https://clil4steam.pixel-online.org/tr_created-sch.php?id_asch=37&section_asch=creation
- https://clil4steam.pixel-online.org/tr_created-sch.php?id_asch=76&section_asch=creation

Reviewed teaching resources

- https://clil4steam.pixel-online.org/tr_reviewed-sch.php?id_asch=30&section_asch=review
- https://clil4steam.pixel-online.org/tr_reviewed-sch.php?id_asch=31&section_asch=review
- https://clil4steam.pixel-online.org/tr_reviewed-sch.php?id_asch=32&section_asch=review
- https://clil4steam.pixel-online.org/tr_reviewed-sch.php?id_asch=59&section_asch=review
- https://clil4steam.pixel-online.org/tr_reviewed-sch.php?id_asch=70&section_asch=review
- https://clil4steam.pixel-online.org/tr_reviewed-sch.php?id_asch=93&section_asch=review
- https://clil4steam.pixel-online.org/tr_reviewed-sch.php?id_asch=191&section_asch=review
- https://clil4steam.pixel-online.org/tr_reviewed-sch.php?id_asch=192&section_asch=review
- https://clil4steam.pixel-online.org/tr_reviewed-sch.php?id_asch=195&section_asch=review
- https://clil4steam.pixel-online.org/tr_reviewed-sch.php?id_asch=210&section_asch=review
- https://clil4steam.pixel-online.org/tr_reviewed-sch.php?id_asch=196&section_asch=review

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Project Number: 2019-1-PL01- KA201-065027

What's the probability of ...?

Teacher	Country	School
Aneta Seremak Agata Ziętek	Poland	Szkoła Podstawowa nr 5 im. Janusza Kusocińskiego w Świdniku

Students' Age	Subject	Topic	Students' target level of competence (CEFR)	Language Skills
13-14	• Math	Probability	B1 B2	• Listening • Speaking • Reading • Writing • Interaction

Learning objectives (related to curriculum content)

Students should be able to:

- Explain what probability is
- Demonstrate how probability is used
- Find the probability of simple events and mutually exclusive events
- Know key vocabulary in English

Learning outcomes

Students will be able to use probability to solve real-life examples.
Students will acquire the basic English vocabulary related to probability and will be able to explain the outcome of experiments in English.

Cognitive skills

Students will understand and be able to explain the outcomes of probability experiments. They will be able to define what probability is. They will improve their sustained, selective, divided attention, long term memory, logic, and reasoning.

Language Function

Students will be able to explain what probability is.
Students will learn to describe, analyze, summarize and draw conclusions.

Key language

Vocabulary:

- Probability line, event, odd number, even number, event, dice, outcome, heads, tails, fraction, decimal

Verb:

- Occur, throw, appear, refer, toss, define

Language structure:

- Present simple tense, conditional sentences, modal verbs, future simple

Activities

102) Introducing the topic and the key vocabulary.
103) Demonstrating the video lesson, when the teacher wants to ask questions and give an explanation to the content the video is paused.

Co-funded by the Erasmus+ Programme of the European Union

104) Students are provided some time to work individually with the glossary to improve their reading skills and practice new vocabulary.
105) The teacher makes sure that students understand the content by giving them problems selected from slides. The teacher presents the slides and makes pauses in certain moments to allow students to make notes, asks questions and develop some presented problems. The teacher should give them feedback and show students more examples on the blackboard. Students should do similar exercises in pairs.
106) Demonstration of the maths is a fun website and carrying out the probability experiments working in groups.
107) Students do the dictionary with new words presented during the lesson.
108) The teacher asks students to reflect on what they have learned and summarizes the lesson.
109) As homework teacher can ask students to do Exercise 1.

Assessment FOR learning

At the end of the classes the teacher questions the students, observes the students' work, and provides feedback and gives support.

Assessment OF learning

Students fill the test.

Material, resources, web tools

Video Lessons

- https://clil4steam.pixel-online.org/video-library-sch.php?id_asch=16

Created Teaching Recources

- https://clil4steam.pixel-online.org/teaching-resources-sch.php?id_asch=41&section_asch=creation
- https://clil4steam.pixel-online.org/tr_created-sch.php?id_asch=42&section_asch=creation

Reviewed Teaching Resources

- https://clil4steam.pixel-online.org/teaching-resources-sch.php?id_asch=43&section_asch=review
- https://clil4steam.pixel-online.org/teaching-resources-sch.php?id_asch=155&section_asch=review

Co-funded by the Erasmus+ Programme of the European Union
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.