CLIL Module Plan

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School Grade	○ Primary		○ Middle		◉ High
School Year	○ 1	○ 2	○ 3	○ 4	◉ 5
Subject	Fisica	**Topic**	Air motion and Aerodynamics		
CLIL Language	◉ English		○ Deutsch		

Personal and social-cultural preconditions of all people involved	Students belong to two different courses of study, i.e. Means of Transport (3 people) and Logistics (4 people). Over the last five years, these students have been sharing most of their school time and activities in the same workgroup, even if they follow slightly different study plans from one another. The first group only has some specific knowledge of Aerodynamics and Mechanics of Flight, and this could provide support to the development of the didactic work. There are no special needs in the class group and there are no students causing particular problems, even if the learning level is not the same for all class members. The teacher often needs to regain the attention of the group and repeat what has already been developed in the lesson class. Nevertheless, as regard to practical activities and specific projects, students have always demonstrated motivation and interest by doing quality work. The limited number of students results in an unusual situation in the class, since no clear distinction can be made between group and whole class interaction. Teacher profile: the T currently teaches Electronics and IT, but is qualified to teach Physics. He obtained a C1 level (Cambridge CAE) last year. There is no need for a co-teacher. Student group profile: all Ss are Italian mother tongue and their English language level is quite homogeneous (Average CEFR Level B1 +). No previous experience in CLIL is reported.

Students' prior knowledge, skills, competencies	Subject	Language
	The course requires no prior specific skills related to the subject, since it was designed as an introduction to the topic. Students just need to have a solid background knowledge of Science about base Classical Physics (Newtonian mechanics, solid body Physics, conservation of matter and energy, gravitational law). Of course, Students should be familiar with Scientific Method: in their daily school activities, they are used to making observations, thinking of questions, developing predictions and explanations. A group of Ss benefits from the fact that it has got some specific knowledge of Meteorology, Aerodynamics and Mechanics of Flight.	No prior knowledge of micro-language concerning specific vocabulary and grammar is required for developing the lessons. Grammar structure: conditionals, present simple, present continuous, present perfect and present perfect continuous, past simple, past continuous, comparatives, superlatives, selected phrasal verbs.

Timetable fit	⦿ Module	Length 10 lessons - 20 h

Description of teaching and learning strategies	The teacher (T) tries to apply the main principles of CLIL teaching. He supports the idea that education is development from within rather than formation from outside, and tries to create a learning environment as interactive as possible. The T forms groups of work, which differ from one activity to another, and provides students (Ss) with the material and a clear explanation of the work to be done. A wide range of teaching tools are used to meet different learning methods and activities continuously switch from one type to another. There is a common thread that connects the lessons; every single lesson, however, is designed to have its own autonomy. All lessons begin with an activation process aimed to light the spark of curiosity in the Ss (open-ended questions, brainstorming and prediction). For each activity, the T sets a time limit with which he tries to comply. The time required depends upon the Ss' ability and engagement. When the work is particularly productive, the T doesn't stop the activity and increases the time available. Inversely, some lessons could finish ahead of schedule; in some cases, spare activities are planned. When the T gives a presentation, he regularly projects some questions to engage Ss; when Ss give a presentation, the T will provide feedback just at the end of the activity, so that he doesn't affect the rhythm of the speech and the speaker's confidence. Language learning takes place in the specific context and generally does not refer to explicit rules. Ss are continuously encouraged to speak their mind openly and the speaking focuses on communication rather than accuracy. During the discussion, the T rewards every attempt by the Ss to provide food for thoughts and usually sees their opinions as complementary pieces of an overall view. The formative assessment provides direct feedback to Ss and aims at enhancing motivation, understanding and language use. In all activities, peer-reviewing and teaching are strongly encouraged.

Overall Module Plan

Unit: 1 Air and atmospheric motion **Unit length:** 8 h	**Lesson 1** ABCs of Physics
	Lesson 2 Force and pressure
	Lesson 3 Pressure in the atmosphere
	Lesson 4 Elements of Meteorology

Unit: 2 Aerodynamics **Unit length:** 4 h	**Lesson 1** Laws of motion in Aerodynamics
	Lesson 2 Theory of lift

Unit: 3 Dynamics of flight **Unit length:** 8 h	**Lesson 1** Aerodynamics and airfoils
	Lesson 2 Lift over an airfoil
	Lesson 3 Design of an airfoil
	Lesson 4 Conclusion

CLIL Lesson Plan

Unit number	1	**Lesson number**	1	**Title**	ABCs of Physics

Activity	**Timing**	**Learning Outcomes**	**Activity Procedure**	**Language**	**Interaction**	**Materials**	**Assessment**

1	5	Get the overall picture of the course. Get an idea of how the current lesson is planned. Be aware of learning outcomes.	T illustrates the overall Lesson Plan (U1_L1_ALL14) and underlines the general learning outcomes he considers of major importance; among others: promoting collaboration, utilize effective group problem-solving, develop critical thinking skills, make interdisciplinary connections, collect and manage specific information by use of the Internet, identify keywords and key-concepts and increase english-speaking confidence. Besides the general objectives, Ss are expected to demonstrate an understanding of basic Aerodynamics and the related micro-language. Then the T briefly introduce the present lesson in more detail.	**Skills** L S R W **Key vocabulary** Plan, schedule, learning outcomes, activity, interaction, time limit. **Communicative structures** Here's what I've prepared for you…. You will discover that… You are expected to… A hard job awaits you.. If you have any questions, feel free to ask...	☒ Whole class ☐ Group work ☐ Pair work ☐ Individual work	• U1_L1_ALL14.pdf	

2	18	Recall derived units of measurements and their meaning. Realise how physical quantities refer to physical phenomena. Guess other possible connections between the proposed units of measurements and images.	The T projects the slide U1_L1_ALL1 on the screen and explains how to find relationships 1:1 between units of measurements and images. Just one word is intrusive. In some cases, more than one answer is correct, but a “most correct” one always exist. Individually, Ss watch the screen and take notes progressively. As soon as they finish, they check their answers in pairs or in group. The T sets a 15 minutes time limit for the activity.	**Skills** L S R W **Key vocabulary** Unit of measurement, base and derived quantities, relationships, match, intruder. **Communicative structures** Look at the picture… What do you think is...? Can you identify the relationships…? Every image should prececisely match..	☐ Whole class ☐ Group work ▣ Pair work ▣ Individual work	• U1_L1_ALL1.ppt	

3	12	Define what a measurement in physical science is. List some well-known Physicists. Distinguish accuracy from precision. Identify statistical and systematic mistakes.	T presents a slideshow (U1_L1_ALL2) to illustrate some basic Physics concepts that Ss may have forgotten over the last three years of study. Ss follow the T's lecture and are free to interrupt at any time in order to ask questions and express opinions. Throughout presentation, some specific questions are outlined; cooperative replies to these questions are expected. The T takes part in the discussion and, when needed, reviews the Ss answers. Each student is also asked to take note of some keywords. In the lessons to come, Ss will carry on with this work little by little, as they find new additions to their lists.	**Skills** L S R W **Key vocabulary** Physics, International System, magnitude, uncertainty, accuracy, precision, error, mechanics, force, object, motion, reaction. **Communicative structures** Look at the list.. This is what Wikipedia says… Do you know some more? …you all heard about. The first step in … What do these mean?	▣ Whole class ▣ Group work ▣ Pair work ▣ Individual work	• U1_L1_ALL2.pptx	Formative: T evaluates what Ss recall about the scientific method and assess content and language.

4	20	Apply physical quantities to describe human activities. Use their imagination to recognize the most relevant physical phenomena involved in practical activities. Combine knowledge to come to new conclusions.	The solution (U1_L1_ALL3) to the previous exercise (U1_L1_ALL1) is projected. Ss, in turn, describe one of the relationships they have found and report the related physical quantities. Then they compare their findings with the projected solution and discuss it. All the students should take part in the discussion; they help each other out, express doubts and ideas. In the second part of the lesson, T arranges Ss in pairs and ask them to find out new associations. Ss work in tandem and look for as many relations as they can in U1_L1_ALL1. Every pair then reports their findings on the board and illustrates them to the class (Es: 1A, 3G, 8G). New terms related to the images are discussed, too.	**Skills** L S R W **Key vocabulary** Isobar, infrared imaging, cable, acceleration, engine, crane, waterfall. **Communicative structures** What is the connection between...? Do you remember the law..? Why do you think..? I'm sure you can find many more... I agree/disagree because...	▣ Whole class ▣ Group work ▣ Pair work ☐ Individual work	• U1_L1_ALL1.ppt • U1_L1_ALL3.ppt	Formative: T circulates, facilitates and assess how effectively Ss learn and communicate.

5	25	Apply what they have just learned in new situations. Draw a graph where pairs of physical quantities interconnect. Describe physical quantities with the SI units of measurement. Identify the physical law behind each connection. Retrieve relevant knowledge from long-term memory.	T form pairs and provides them with an interactive .ppt file (U1_L1_ALL4), containing clues on how to build a graphical network starting from the 7 base International System units. Every SI unit is represented by means of a blue circle; derived units are represented through orange circles. Circles interconnect through lines and each circle pair gives rise to one or more other circles. In pairs, Ss build the graph using all given objects and trying to remember the appropriate derived units of measurements. At the end of the work, Ss take a look at the solution (U1_L1_ALL5) projected on the board and discuss their findings in the group.	**Skills** L S R W **Key vocabulary** Graph, link, interconnection, law, base and derived units. **Communicative structures** What is the definition for…? How do we measure..? Do you remember what..?	☒ Whole class ☐ Group work ☒ Pair work ☐ Individual work	• U1_L1_ALL4.ppt • U1_L1_ALL5.ppt	The T circulates, facilitates and judges how Ss collaborate.

6	10	Recall units of measurements and their meaning. Retrieve previous learned information.	The T access the Google Form titled Fundamentals of Dynamics (link) and provides Ss with the weblink to compile the form (insert the Ss mail addresses in the “Send” box within the Google Form page). Then Ss answer the questions, individually; if they want, Ss may discuss the solutions. At the end of the work, the answers are briefly reviewed one after another. The quiz was previously created by the T in Google Form tool; the T may access the form, which is in the public domain (no account required), and freely modify the answers and the form setting. The list of questions and related answers are displayed in U1_L1_ALL6: two images were used in the form (U1_L1_ALL7 and U1_L1_ALL8).	**Skills** L S R W **Key vocabulary** Newton, velocity, body, friction. **Communicative structures** The answer shall be submitted.. You may compare your answers when you have difference of opinion.. Do you remember which is the...?	▣ Whole class ☐ Group work ☐ Pair work ▣ Individual work	• U1_L1_ALL6.pdf • U1_L1_ALL7.jpg • U1_L1_ALL8.jpg	Formative assessment to check the class understanding (no marks). T gives feedbacks to improve Ss learning and attainment.

7	5	Identify and write down keywords. Create a class glossary.	T provides the Ss with a spreadsheet to be filled with keywords and instructions. A weight factor will be established for every new addition, which expresses the relevance of the keyword to Aerodynamics in a 1 to 10 scale. F One student is selected to typewrite. Ss will present the Keywords they have identified (individually, from the start of the lesson) and will discuss (as a group) about which ones should be registered in the spreadsheet file. The whole stuff has to be shared by all of the class components, for the creation of a class glossary. From now on, a concise Keywords glossary will be redacted.	**Skills** L S R W **Key vocabulary** Weight factor, keyword, relevance, list, glossary. **Communicative structures** From now on... You should be in agreement about... This is an important task, what for? ...identifying keywords is the same as recognizing key-concepts..	☑ Whole class ☐ Group work ☐ Pair work ☐ Individual work	• U1_L1_ALL9.xlsx	
8	Spare activity	Create and edit a course dictionary.	Student are divided in 3 groups (A, B and C).	**Skills**	☑ Whole class	• U1_L1_ALL10.doc • U1_L1_ALL11.doc	Formative, focus on language; the

		Review other Ss' writing and speaking. Identify what is important to remember.	T supplies each group with some words (U1_L1_ALL10, U1_L1_ALL11 and U1_L1_ALL12) to be defined. In each group, Ss discuss the meaning of the given words and try to give correct definitions. They are allowed to use an online dictionary (Wordreference.com) but, as much as possible, they have to use their own words. The T gives support and gives hints to Ss who get stuck (Are you sure that...? Have you thought about..?) When Ss have finished, their vocabularies are projected on the board, one after another. A student from group A reads Vocabulary_B, written by group B. Every member of groups A and C, in turn, finds out at least one mistake in the given definition, concerning	L S R W **Key vocabulary** Vocabulary, peer-review, definitions. **Communicative structures** Try to be as precise as possible. Your classmates should be able to...	▣ Group work ☐ Pair work ☐ Individual work	• U1_L1_ALL12.doc • U1_L1_ALL13.xlsx	T helps with pronunciation and meaning. Peer-reviewing.

			language or meaning. After every comment, Ss confront and try to correct each other. At the end, a student from group B reads Vocabulary_C and the process is repeated. Ss use a Rubric to evaluate their classmates U1_L1_ALL13.				

CLIL Lesson Plan

Unit number	1	**Lesson number**	2	**Title**	Force and pressure

Activity	**Timing**	**Learning Outcomes**	**Activity Procedure**	**Language**	**Interaction**	**Materials**	**Assessment**
1	3	Get a picture of the current lesson plan and learning outcomes.	T outlines the present lesson in brief and shows the Learning Outcomes on the board: Ss should recall their knowledge of Classical Physics, should be able to permorm a lab experiment in group and to give a clear presentation of their findings to the class.	**Skills** L S R W **Key vocabulary** Plan, schedule, experimental activity, learning outcomes. **Communicative structures** This is our plan today. You will observe... I expect you to brainstorm... Do you think it is a hard work for you to recall...?	☑ Whole class ☐ Group work ☐ Pair work ☐ Individual work		

2	18	Adjust a text by concentrating both on language and conceptual aspects. Recall and connect pieces of knowledge about Classical Mechanics for solid bodies.	T provides Ss with a text related to Newton Mechanics to be adjusted (U1_L2_ALL1). The task is to correct the given text so that all the underlined words are put in the correct positions. In pairs, Ss work at their PC and discuss how to put the words in order. To help Ss, a picture showing an inclined plane is projected on the board (U1_L2_ALL2).	**Skills** L S R W **Key vocabulary** Force, vector/scalar quantity, magnitude, parallelogram rule, free body, tug of war. **Communicative structures** Now it's time to draw your knowledge.. Put them in the correct order.. Because of these characteristics...	☐ Whole class ☐ Group work ☒ Pair work ☒ Individual work	• U1_L2_ALL1.docx • U1_L2_ALL2.jpg U1_L2_ALL2 *Projected on the board	

3	10	Clarify what the statements in the text mean. Practice reading skills. Provide feedback on each other.	The solution to the previous work is projected on the board. Ss in turn read a part of their revised text and, then, give a look to the solution projected on the board. If needed, other Ss help the S on duty to understand its mistakes. While Ss are in the process of discussing the solution, the T role is like an advisor, helping them with the pronunciation and meaning.	**Skills** L S R W **Key vocabulary** As previous activity **Communicative structures** Are you sure that...? What does it mean? How do they connect?	☒ Whole class ☐ Group work ☐ Pair work ☐ Individual work	• U1_L2_ALL3.docx	Formative: T monitors Ss learning and provides ongoing feedback on both content and language. The main focus is on understanding and on reading skills. He also exhorts Ss to provide feedback on each other.
4	20	Search for information on the Web like clockwork. Identify keywords to make the search as effective as possible. Practice with writing and reading. Cooperate to	T arranges Ss in four groups and provides each of them with a question related to application of science. All four questions are projected on the board (U1_L2_ALL4), together with some instructions. Ss seek information on the Web and collaborate to formulate a clear answer to the given	**Skills** L S R W **Key vocabulary** Esteem, dangerous, boiling, elevation, underwater.	☒ Whole class ☒ Group work ☐ Pair work ☐ Individual work	• U1_L2_ALL5.docx • U1_L2_ALL4.docx	Formative: T asses the Ss' findings by comparing their answers to what he expected to be the correct ones. Every positive contribution will be rewarded. The T evaluates what the Ss

		be effective in completing a task. Discuss findings with the classmates.	question. Since the time limit is not long, the process should be as efficient as possible; therefore, part of the activity is being able to distribute tasks among various group's members. When SS have finished, one after another, groups' spokespersons read their answer to the class. The other Ss may ask for explanations. The T, knowing the answers (U1_L2_ALL5), express its opinion and gives feedback on language mistakes.	**Communicative structures** Use a web engine and search for…. Report the… you have… Do you think that it is possible…? Try to be as fast as you can…			have written and how they present it, too.

5	20	Perform an experiment. Solve the problem within the group. Enjoy the process of undermining what is taken for granted. Find out an explanation for a physical phenomenon that may seem bizarre.	T leads Ss to the Physics Lab. Then he forms the groups and hands out the worksheets for each experiment. T outlines that Ss should carry out the experiment trying to understand why phenomena behave the way they do. Ss in a group read their worksheet and perform the experiment. They observe and discuss. More details in the worksheets.	**Skills** L S R W **Key vocabulary** Glass, flame, empty, hole, plate. **Communicative structures** Perform the experiment and see what happens. Instruction are given in detail..	☐ Whole class ☒ Group work ☐ Pair work ☐ Individual work	• U1_L2_ALL6.doc • U1_L2_ALL7.doc • U1_L2_ALL8.doc • U1_L2_ALL9.doc Paper form + related hardware material	Formative during the experiment: T monitors Ss' operations and models language, content and cognition.

6	10	Prepare a presentation of the experimental procedure and the results. Describe the experiment and its outcomes.	In the Informatics Lab, explains Ss how to prepare the presentation. Ss should aim to explain their classmates all they have done in laboratory: experimental goals, procedure, outcomes and explanations they have found. T also hands out the grids with marking criteria (U1_L2_ALL10) one sheet per person). Before they get started, Ss take a look at the grid so that they know how to deliver a proper presentation.	**Skills** L S R W **Key vocabulary** Presentation, mark, assessment, provide, explanation, strengths, rehearse. **Communicative structures** A gooe experimental work always ends with a presentation. You ought to be as clear as... You need to tell your colleagues... Keep in mind that your classmates...	☐ Whole class ☒ Group work ☐ Pair work ☐ Individual work	• U1_L2_ALL10.docx Paper form	Formative: while Ss work at the PC, T circulates and facilitates.

7	25	Present the experimental findings to the class. Give an insight into what they have learned. Review their classmates' presentation performance.	One after another, groups go to the board and, through one or more spokespersons, give the presentation to the class (about 5 min). In the meanwhile, the other Ss, individually, evaluate each presentation by means of the grid they were given (U1_L2_ALL10). They also may write down specific comments. After every presentation, other Ss express opinions and ask questions: all of the group's components should contribute to provide explanations. The T is involved in the discussion, too, and fills the same marking sheets. He collects the Ss sheets and will communicate the marks he established over the next activity.	**Skills** L S R W **Key vocabulary** Message, audience, understanding, essential, fill, recommendation. **Communicative structures** Were the main ideas presented in a …. manner? Did the talk maintain the interest…? Were the main issues..?	☒ Whole class ☒ Group work ☐ Pair work ☒ Individual work	• U1_L2_ALL10.docx Paper form	Summative: the T uses the grid to assess how Ss have presented their work as regard to clarity, use of vocabulary, interaction with the audience, overall niceness... Peer-review: every group of Ss evaluates the other groups' exhibition on the basis of the same assessment criteria. The overall mark of every group consists for 50% of T's assessment and for 50% of Ss' assessment.

8	Spare activity	Identify key-concepts and the related keywords. Discuss the specific terminology.	T ask Ss to update their Keywords file as a group or, if they prefer, as a class. Ss discuss the new terms to be added to their list together with a weight factor. The weight factor expresses the relevance of a certain keyword to the topic of Aerodynamics in a 1-to-10 scale. In the meanwhile, the T establish the marks related to the previous activity and then communicate them to the Ss. T tells the Ss that in the lesson to come they will have to make a brief test in order to verify what they have just learned.	**Skills** L S R W **Key vocabulary** Update, improvement, take-home message. **Communicative structures** I appreciate the fact that.. In my opinion, you all have to…	☒ Whole class ☒ Group work ☐ Pair work ☐ Individual work		

CLIL Lesson Plan

Unit number	1	**Lesson number**	3	**Title**	Pressure in the atmosphere

Activity	**Timing**	**Learning Outcomes**	**Activity Procedure**	**Language**	**Interaction**	**Materials**	**Assessment**
1	15	Activate Thinking. Look at a physical situation from different perspectives and using Problem Solving. Make up their own minds about the issue and predict an explanation.	T forms groups (max 3 Ss) and projects a question on the board (...do you know how to measure the height of a tall building using a barometer?). While Ss reflect on the issue, the T walks around and gives hints to Ss who get stuck.	**Skills** L S R W **Key vocabulary** Barometer, height, building, pressure, trivial, perspectives. **Communicative structures** Show how it is possible to determine ... What solution do you suggest for ....? I'm sure that each of you knows the most obvious... but if you use your imagination...	☐ Whole class ☒ Group work ☐ Pair work ☐ Individual work	• U1_L3_ALL1.jpg	

2	3	Get an idea of how the current lesson will develop and what the subject will be.	T illustrates the plan of the current lesson and encourages Ss to ask for explanations and take note of the keywords over the next two hours.	**Skills** L S R W **Key vocabulary** Plan, schedule, learning outcomes, activity. **Communicative structures** Just to sort things out, this is our overall plan.. Today we focus on topics you all have already learned about... I ask you to keep taking notes..	☒ Whole class ☐ Group work ☐ Pair work ☐ Individual work		

3	15	Discuss proposed solutions. Provide feedback on each other. Stimulate use of creativity and imagination. Adjust specific micro-language.	The groups go to the board, write down their findings in few words and provides explanations to the class. At any moment, Ss may interrupt their classmates and express their opinions, agreement or disagreement. T supervises the activity and gives its personal view, eventually, trying to reward every attempt by the Ss to provide food for thoughts. At the end of the activity, the T gives feedback on the language that Ss have produced: he underlines Ss' mistakes with focus on pronunciation and use of appropriate terminology.	**Skills** L S R W **Key vocabulary** Height, pressure, level, gradient, measure, shadow. **Communicative structures** Very good, that's a good point.. Have you thought to the possibility of...?	☒ Whole class ☐ Group work ☐ Pair work ☐ Individual work	• U1_L3_ALL1.jpg	Formative: T assess content and language.

4	10	Stretch out the set of answers given by the Ss. Apply laws of physics to find different solutions. Understand that, contrary to expectations, a series of non-obvious solutions is possible. Realize that creativity is born when you have problem to solve and look for unorthodox solutions.	T provides each S with a well-known text (The Barometer Story, U1_L3_ALL2), which contains some answers to the above-mentioned question given by some American Ss. One after another, Ss read out part of the text and then the whole group discuss it. The T help Ss to figure out which physical laws are involved in the given answers (barometric pressure, accelerated motion, similar triangles, gravity and pendulum). While a S is reading aloud, other Ss and the T notice pronunciation mistakes. The class outlines and discusses the new terms, too.	**Skills** L S R W **Key vocabulary** Solution, barometric pressure, roof, ground, acceleration, gravity, string, pendulum. **Communicative structures** There are many ways of getting the height.... I really like this story because it allows us to expand our thinking. Do you think this is a good way of...?	☒ Whole class ☒ Group work ☒ Pair work ☐ Individual work	• U1_L3_ALL2.docx	Formative: T assess reading skills and, if needed, clarifies the meaning of unknown words.

5	10	Think critically at The Barometer Story. Analyse the text to extrapolate relevant information.	Ss are randomly grouped in pairs and are supplied with a question sheet (Who thinks critically?, U1_L3_ALL3). Questions refer to the The Barometer Story. To write down answers, Ss can consult an online dictionary (Wordreference.com), if they want, without overdo it.	**Skills** L S R W **Key vocabulary** Critical thinking, science, discoveries, moral. **Communicative structures** What does the story teach us? Answer these questions... You are allowed to use.. Try to use your own...	☐ Whole class ☐ Group work ☒ Pair work ☐ Individual work	• U1_L3_ALL2.docx • U1_L3_ALL3.docx *Paper form wordreference.com	

6	15	Share and compare ideas; match results. Use and appreciate the natural human method of Critical Thinking.	The T’s answers (U1_L3_ALL4) to the previous questions are projected on the board. T reads a question and groups’ representatives, in turn, read out their own answer. T stimulates debate, given also that no single answer can be regarded as complete. In some way, answers are combined as tiles of a unique mosaic. The process is repeated for all other questions. Every student is encouraged to give its personal view and report personal experience, which may enrich the argument. Language issues are highlighted, as well.	**Skills** L S R W **Key vocabulary** Critical Thinking, mental equipment, human method, scientific method, key ideas, progress, turning point, environment. **Communicative structures** He had not observed,… he wouldn't never have survived. A reasonable question to ask in this connection is… That’s a good point… I agree with you…	☒ Whole class ☐ Group work ☐ Pair work ☐ Individual work	• U1_L3_ALL4.docx	Formative: T monitors Ss learning and provides ongoing feedback on content and language.

7	10	Extrapolate information from an educational movie. Discuss the unknown words. Develop a wide view about how air molecules behave in the atmosphere. Analyse the phenomena that affect air pressure.	T shows the video Pressure and wind, which is an adaptation of a short instructional movie found on the Web (www.youtube.com/watch?v=eyjHpbYiRs4&t=2s). Ss watch the video and try to catch information entirely. They shouldn't hesitate to ask for explanations. If needed, T stops the video and helps with the understanding of the content.	**Skills** L S R W **Key vocabulary** Air molecule, hurricane, barometer, dense, cold/warm, convection cell, downdraft/updraft, water vapour. **Communicative structures** What makes the wind stronger? Air pressure is affected by… As the Earth spins, …	☒ Whole class ☐ Group work ☐ Pair work ☐ Individual work	www.youtube.com/watch?v=eyjHpbYiRs4&t=2s, Standard Youtube licence, accessed February 2, 2018	Formative: focus on listening skills.

8	15	Re-elaborate what they have learned from the video. Discuss the answers with the class.	T provides students with a paper sheet (U1_L1_ALL5) with multiple-choice questions related to the video. Ss, individually, fill the sheet (time limit of 5 minutes); when they have finished, the T depicts the right answers (they can be found in U1_L1_ALL6) on the board and stimulates debate. As much as possible, Ss should help their classmates to understand the answers.	**Skills** L S R W **Key vocabulary** Air molecule, hurricane, barometer, dense, cold/warm, convection cell, downdraft/updraft, water vapour. **Communicative structures** After you have watched the video… What role does pressure play…? Now compare your views...	☒ Whole class ☐ Group work ☐ Pair work ☒ Individual work	• U1_L3_ALL5.docx • U1_L3_ALL6.docx U1_L1_ALL5 in paper form	Ss peer-reviewing, focus on content. Summative: T assess what the Ss have learned over the last two activities.

9	Spare activity	Understand the relationship among pressure, wind and Earth’s rotation. Apply what they have previously learned in a slightly different topic.	T presents a slideshow (Air pressure and motion, U1_L3_ALL7) to introduce some Physics concepts related to air motion. Ss follow the T’s lecture and are free to interrupt at any time in order to ask questions and express opinions. In almost every slide some specific questions are outlined; cooperative replies these questions are expected. As usually, throughout presentation, each student takes note of the keywords.	**Skills** L S R W **Key vocabulary** Average sea level, pressure system, cyclone, Coriolis force, converging, northern/southern hemisphere, wind, friction, isobars. **Communicative structures** It should be as interactive as possible.. What is the average..? Do you have an explanation for…?	☒ Whole class ☐ Group work ☐ Pair work ☐ Individual work	• U1_L3_ALL7.ppt	

CLIL Lesson Plan

Unit number	1	**Lesson number**	4	**Title**	Elements of Meteorology

Activity	**Timing**	**Learning Outcomes**	**Activity Procedure**	**Language**	**Interaction**	**Materials**	**Assessment**
1	3	Introduce the topic. Get an idea about what the lesson will be.	T depicts the content of the present lesson by projecting the Lesson Plan (U1_L4_ALL8) on the screen. S ask for explanations Ss and begin to take note of the Keywords.	**Skills** L S R W **Key vocabulary** Plan, schedule, learning outcomes, activity. **Communicative structures** This is our plan today. What I expect from you... It would be nice if you could...	☑ Whole class ☐ Group work ☐ Pair work ☐ Individual work	• U1_L4_ALL8.pdf	
2	20	Challenge their colleagues to find out words. Investigate specific vocabulary. Recognize nouns and	T makes pairs and writes the topic on the board (The weather). Then he gives Ss 3 competitive tasks related to the topic: 1. Who is the first pair to write down 10 verbs	**Skills** L S R W	☑ Whole class ☐ Group work ☐ Pair work ☐ Individual work	• U1_L4_ALL1.docx	Formative: T discusses the terms and the concepts Ss have found – focus on the meaning of the words.

		verbs.	related to topic? 2. Who can write the most words in one minute? 3. Who can write the best definition of “Cloud” in exactly 15 words? Who can create the best drawing of it? (7 min) They have to identify terms related to the concept of weather, for instance words like rain, shine, flow, warm, freeze...in the shortest possible time. Ss use their minds and no other information sources. The first pair to finish this task writes its findings on the board. Then Ss complete task 2 and 3 following the deadlines given by the T. T uses a stopwatch and makes sure that rime deadlines are observed. At the end of the work, T use the words Ss have suggested to launch a discussion. More details in the document titled Quickest, most, best	**Key vocabulary** Rain, shine, flow, warm, freeze, cloudy, breeze, cumulonimbus... **Communicative structures** Let's see if you can guess.. Let's see how fast you are.. What does it mean...? Now work as artist....			The T intervenes just after that Ss have presented and explained their findings to the class.

			(U1_L4_ALL1).				
3	20	Search on Wikipedia and write down definitions. Find out ways, related to grammar and meaning, to cheat their classmates. Analyze and review a text with hidden mistakes.	Ss, divided into groups (3 people max), receive a sheet with a definition to be filled. Ss depict an appropriate definition in the blank space (10 lines maximum) and, on purpose, insert 3 conceptual mistakes and 3 grammatical mistakes. Wikipedia is used to formulate a (in)correct definition, but Ss try to create sentences by their own. After 5 min, the sheet is given to another group, which seeks to identify as many mistakes as it can. At the end of the work Ss discuss their revised versions with their own “editors”. The T checks out the documents that Ss have produced and gives explanations, if needed.	**Skills** L S R W **Key vocabulary** Thorough, atmospheric circulation, high/low pressure, large scale. **Communicative structures** Your goal is to make it difficult for you classmates to… Be as ruthless as you can…	▣ Whole class ▣ Group work ☐ Pair work ☐ Individual work	• U1_L4_ALL2.docx • U1_L4_ALL3.docx • U1_L4_ALL4.docx Wikipedia.org	Formative: the T evaluates the definitions given by the Ss. Ss correct their classmates’ exercises (peer-correction).

4	10	Watch a video and extrapolate relevant information. Discuss and learn specific terminology.	The T shows a short animation entitled Coriolis Effect (link, Standard Youtube licence, accessed February 10, 2018) to illustrate the argument. If needed, the T stops the video, rewinds and helps understanding. Ss watch the video and take as many notes as they can. They are going to make use of all the gathered information over the next activities.	**Skills** L S R W **Key vocabulary** Coriolis, clockwise, anticlockwise, rotation, inertial force, reference frame. **Communicative structures** Watch it carefully and stop me if you need to... Do you think this is a phenomenon that ...? Did you get the sense...?	☒ Whole class ☐ Group work ☐ Pair work ☒ Individual work	link, Standard Youtube licence, accessed February 10, 2018	Formative: T facilitates.

5	15	Prepare a speech based on the slides designed by someone else . Interpret the message contained in graphical objects related to Meteorology. Find out explanations for the new words.	T forms pairs and provides them with some slides about weather and climate (U1_L4_ALL5). Ss in pairs prepare a presentation based on the slides they were given. They should conceive the speech as if they were to make a full presentation of the topic to high grade Ss. They may need the help of an online encyclopaedia; in order to avoid waste of time, the T suggest to use Wikipedia, only.	**Skills** L S R W **Key vocabulary** Weather: dew, fog, frost, gentle breeze, icy, freezing…. Climate: altitude, latitude, continentality, stream, greenhouse effect…… **Communicative structures** Put yourselves in the T's shoes … Your speech should cover…	▣ Whole class ☐ Group work ☐ Pair work ☐ Individual work	• U1_L4_ALL5.pptx Wikipedia.org	

6	30	Give a piece of presentation and connect to the previous speech given by another S. Attempt to reconcile the various interpretations and points of view. Play the part of a T and a S, simultaneously.	T projects the slides on the board and calls Ss randomly, one after another, to give the talk (one slide per S). The S on duty presents the slide so that every speech could be regarded as a piece of the whole presentation: therefore, Ss should aim at connecting to the previous speech and facilitating the next one. The T assist to Ss' presentations and takes notes about their language mistakes and presentation skills. At the end of the presentation, the Ss debate the different ways they have interpreted some slides. The T provides feedback both on content and language.	**Skills** L S R W **Key vocabulary** Weather: dew, fog, frost, gentle breeze, icy, freezing…. Climate: altitude, latitude, continentality, stream, greenhouse effect…… **Communicative structures** Do you all agree…? What do you think could be another… Let's see this from a different perspective….	☑ Whole class ☐ Group work ☐ Pair work ☐ Individual work		Formative: T assist the Ss' presentations and provides ongoing feedback. The focus is on vocabulary and presentation skills. Throughout presentations, Ss may correct their classmates.

7	Spare activity	Read a weather map and describe some well-defined weather conditions. Identify the most relevant piece of information that is needed to answer a question. Use the most suitable words to make a meteo forecast.	T forms groups (max 4 people) and provides them with two weather maps depicting meteorological conditions over Europe (temperatures and clouds). Every student within a group, in secret, chooses an European city and describes what the weather is like in this city. Other Ss within the group are supposed to guess which city the speaker is speaking of; they can make one question and give one answer at a time. If they find the city in time, another S choose a city and describes its weather. If, after 5 minutes nobody finds out the city, the S discloses the secret.	**Skills** L S R W **Key vocabulary** Weather map, clouds, contour, coverage, temperature, capital city. **Communicative structures** I think you are familiar with meteo forecasts.. Try to guess which is... by... Your job is to ask the right....	☐ Whole class ☒ Group work ☐ Pair work ☐ Individual work	• U1_L4_ALL6.jpg • U1_L4_ALL7.jpg	Formative: T monitors the groups' work and models language and content.

CLIL Lesson Plan

Unit number	2	**Lesson number**	1	**Title**	Laws of motion in Aerodynamics

Activity	**Timing**	**Learning Outcomes**	**Activity Procedure**	**Language**	**Interaction**	**Materials**	**Assessment**

1	15	Watch a bizarre phenomenon and debate it. Combine what they have observed and what they already know in order to undermine a preconceived idea. Predict an explanation.	Teacher set up the experiment in advance: he inflates two balloons, tying off the end of each balloon; then the balloons are suspended at the same height, several centimetres apart (more details in U2_L1_ALL1). By blowing air directly between the balloons, the balloons will come together. In class, the T presents the activity and invites Ss to blow between the balloons and observe what happens. In order to blow more forcefully Ss may use the straw. After Ss think individually to the phenomenon, they share their thinking. The final explanation (Bernoulli's principle) should be clear to them all.	**Skills** L S R W **Key vocabulary** Balloon, inflate, suspension, tie, straw. **Communicative structures** It is weird, isn't it? What for the balloons should…after ….? Do you agree with…? What does it mean…?	▣ Whole class ☐ Group work ☐ Pair work ☐ Individual work	• U2_L1_ALL1.docx	Formative: T supervises the experiment and evaluates how actively Ss partecipate.

2	15	Prepare and deliver an effective presentation of a given topic. Search the Internet for related information. Compare the different ways Ss interpret a picture.	T arranges Ss in pairs, projects a picture about Bernoulli's principle (U2_L1_ALL2) on the board and provides them with some demands (U2_L1_ALL3). Ss prepare a short speech to describe the situation depicted by in the picture. They are allowed to search the Internet. After 10 minutes one of the pairs is randomly selected to present his own work to the class. During the presentation, the T make questions (Do you think...? Do you agree ... ? Why this is...?) and corrects language mistakes (appropriate terms, grammar, pronunciation). This activity should involve the whole class: the audience, having done the same work, express agreement, disagreement, different perspectives and different vocabulary.	**Skills** L S R W **Key vocabulary** Mass, velocity, pressure, over/above, flow. **Communicative structures** Here we have an incoming mass of air which passes into ... Do you think that it may have an impact on the behavior of an airfoil? Why this is...?	☑ Whole class ☐ Group work ☑ Pair work ☐ Individual work	• U2_L1_ALL2.jpg • U2_L1_ALL3.docx Internet	Formative: T assist the presentation and provides ongoing feedback both on content and language. Peer-review

3	15	Apply the Bernoulli Equation and adapt it to different real situations. Solve a mathematical problem related to Aerodynamics.	T projects two problems on the board, and let Ss set up solutions using the Bernoulli equation. Ss read the text Ss work in pair and solve the exercises using a calculator. After about 10 minutes, Ss reveal their solution; they may come to the board, write down the equations and provide their classmates with explanations, if necessary. The T facilitates understanding. The solution is attached, U2_L1_ALL5.	**Skills** L S R W **Key vocabulary** Fire hose, nozzle, refinery, fuel, pipe, achieve. **Communicative structures** Use the Bernoulli Equation to calculate.... How far must the pipe...?	☒ Whole class ☐ Group work ☒ Pair work ☐ Individual work	• U2_L1_ALL4.docx • U2_L1_ALL5.docx	Formative: T checks the operations at the board and coordinates the discussion. The focus is on content.

4	20	Analyse a text and extrapolate information. Discuss the significance of specific sentences. Identify everyday words used in a specialist way.	T arranges Ss in pairs and provides them a text (U2_L1_ALL6) depicting the most relevant laws of motion in Aerodynamics. The tasks include filling the gaps with parts of the text missing (solution in U2_L1_ALL7), recognizing specialist vocabulary and identifying everyday words used in a specialist way. After 10 min, Ss in turn read a piece of their own text to the class; the other Ss suggest corrections and find solutions without the help of the T. The highlighted specialist and more general words are discussed, too. The T encourages peer reviewing and intervenes just if strictly required.	**Skills** L S R W **Key vocabulary** Aerodynamics, aircraft, motionless, inertia, thrust, drug, lift. **Communicative structures** Try to guess which are the…. There are some words you use everiday.. If you know all the answers it means that you know Aerodynamics. I think that it could be a good exercise….	▣ Whole class ☐ Group work ▣ Pair work ☐ Individual work	• U2_L1_ALL6.docx • U2_L1_ALL7.docx	Ss correct their classmates' exercises (peer-correction); theT facilitates.

5	15	Introduce the topic of aerodynamics of flight. Formulate hypothesis and share opinions with the classmates. Identify keywords.	T presents a slideshow (How do Airplanes fly?, U2_L1_ALL8) to illustrate some basic concepts of aerodynamics of flight. Throughout presentation, some specific questions are addressed. Ss follow the T's lecture and are free to interrupt at any time in order to ask questions and express opinions; cooperative replies to the projected questions are expected. As usually, throughout presentation, each student takes note of the keywords. N.B: if there is time enough, do Spare activity 1 before of activity 5.	**Skills** L S R W **Key vocabulary** Key vocabulary Lift, shape, attached, streamtube, continuity, shear, compressibility. **Communicative structures** Why is pressure lower on top surface? Do you all agree…? What do you think could be another… Let's see this from a different perspective….	▣ Whole class ☐ Group work ☐ Pair work ▣ Individual work	• U2_L1_ALL8.pptx	

6	Spare activity	Make up their own minds about some given queries. Share ideas to formulate some possible answers.	N.B: this activity is intended to be performed before the presentation (activity 5). This is only possible if there is enough time available. T provides pairs (previously formed) with a question sheet which is an introduction to the next topic. T makes clear that at the end of the next activity (T's presentation) they all should be able to answer these questions. Ss are given 5 minutes to think about how to answer the questions. They should write their ideas on the sheet even if they don't know the answers. At the end of the work, the T collects the sheets. The answers will be discussed in the next lesson (U2 L2).	**Skills** L S R W **Key vocabulary** Lift, generation, fluid, airfoil, transmission. **Communicative structures** Do you have an explanation for…? Rub your brains together…. The goal is to find elements that could be helpful to….	☒ Whole class ☐ Group work ☒ Pair work ☐ Individual work	• U2_L1_ALL9.docx Paper form	Formative: T evaluates how actively and critically Ss think at the topic.

7	Spare activity	Discuss the new terminology and compile a dictionary.	Ss update their Keywords file as a group or, if they prefer, as a class. Ss discuss the new terms to be added to their list together with a weight factor.	**Skills** L S R W **Key vocabulary** **Communicative structures** Now update your keyword list.	▣ Whole class ☐ Group work ☐ Pair work ☐ Individual work		

CLIL Lesson Plan

Unit number	2	**Lesson number**	2	**Title**	Theory of lift

Activity	**Timing**	**Learning Outcomes**	**Activity Procedure**	**Language**	**Interaction**	**Materials**	**Assessment**
1	3	Introduce learning outcomes.	T depicts the main content of the lesson and the main learning outcomes. At the end of the lesson, Ss should demonstrate an understanding of theory of lift and know the reason why classical explanations of lift are incorrect. The Ss will learn that often a single theory is not enough to describe a physical phenomenon. Ss ask for explanations and begin to take note of the Keywords.	**Skills** L S R W **Key vocabulary** Plan, schedule, learning outcomes, activity. **Communicative structures** The main goal today is... Your job is to find out the weak points.. I hope you will discover that nothing is absolutely certain in Science.....	☑ Whole class ☐ Group work ☐ Pair work ☐ Individual work		
2	15	Activate thinking through a competition.	The T accesses the Internet and projects the Kahoot main page on	**Skills** L S R W	☑ Whole class	• U2_L2_ALL1.docx link	

		Have fun answering the question related to the topic. Recall prior knowledge and open the way for new information.	the board showing the PIN code, which allows Ss to take part in the activity. This activity was previously prepared by the T (Create Kahoot) and uploaded on the platform; it can be found at the given link (link) or searching for “Motion, Force, and Aerodynamics”. Using any device with a web browser and internet connection, Ss individually visit the website, input the unique PIN and enter a nickname. Then they take part in the quiz and challenge their classmates. During the gameplay, the questions and four multiple-choice answers are displayed on the host's screen. The player taps on the rectangle representing the correct answer. The goal is to answer the questions faster than other players do. Most of questions are known, but some are not: they will serve to make Ss start thinking about the	**Key vocabulary** Demonstration, Earth, counterbalance, path, lift, shock wave, aerodynamics.. **Communicative structures** Let’s see who has got the fastest mind and hand.	☐ Group work ☐ Pair work ☐ Individual work		

			new topic. Questions and answers are given in U2_L2_ALL1.				
3	25	Realize what they lacked before to effectively answer the questions. Prove the understanding of the topic.	T tells Ss that they have to answer the same questions (U2_L2_ALL2) they came across in U2_L1: now they should know the answers. Ss, individually, answer the questions on the sheet without using any informative material (books, notebooks, internet...). At the end of the work, T collects the papers, that will be evaluated later based on the marking grid (U2_L2_ALL3); a recap of this grid is reported in the worksheet so that Ss know about it. The evaluation will build on both content and language. Correct answers can be found in U2_L2_ALL4; more exhaustive answers can be found at the Nasa webpage link.	**Skills** L S R W **Key vocabulary** Lift, generation, fluid, airfoil, transmission. **Communicative structures** Let me see what you have learned.. I will evaluate your answers according to the marking criteria.	☐ Whole class ☐ Group work ☐ Pair work ☑ Individual work	• U2_L2_ALL2.docx • U2_L2_ALL3.docx • U2_L2_ALL4.docx U2_L2_ALL2 in delivered in paper form	Summative: T assess the Ss' answers according to the shared marking criteria. The main purpose is to evaluate what the Ss have learned over the previous activities. Therefore, reasonably correct answers are assessed positively, even if language accuracy is poor. The use of appropriate vocabulary outweighs grammatical correctness.

4	20	Find out weak points in a generally accepted explanation. Implement the critical thinking approach within the group. Distinguish between a hypothetical phenomenon and a sure phenomenon.	T forms groups (max 3 Ss) and projects a picture illustrating the classical explanation for the lift over an airfoil (U2_L2_ALL5). Then he launches the question “What are the weakest points in this explanation?" Ss in groups look at the projected picture and brainstorm. They let their imagination run a constructive dialogue and they express anything they think could be relevant. When they have finished, they write their findings on the whiteboard. The debate will find part of its solution in the next activity. In order to provide additional food for thought, the T may project another picture (U2_L2_ALL6).	**Skills** L S R W **Key vocabulary** Streamline, equal time, trail, wing, molecule, flow. **Communicative structures** This is a good example that clearly shows the weaknessess.. What are the weakest points in.? What do you think could be a…?	☒ Whole class ☒ Group work ☐ Pair work ☐ Individual work	• U2_L2_ALL5.jpg • U2_L2_ALL6.jpg	Formative: T monitors the work and coordinates the discussion.

5	15	Watch a video and extrapolate relevant information. Highlight the main content of the video and the new terms. Make sense of the argument that Ss have investigated previously.	T projects a video about theory of lift (How do wings generate Lift (link; the movie was freely downloadable from Youtube on February, 2018). The animation lays out a thorough answer to the previous question. While watching the video, Ss share opinions, express their doubts, ask for part of the speaking that they do not understand. They should take notes also. The T may provide explanation, stop the video, rewind it and draw on the whiteboard …	**Skills** L S R W **Key vocabulary** Fluid Jet, Coanda effect, convex, longer path, curvature. **Communicative structures** Why the top flow is much faster? What is the truth…? What for there should be the tendency…? How do you think the…affects..?	☒ Whole class ☐ Group work ☐ Pair work ☐ Individual work	link; the movie was freely downloadable from Youtube on February, 2018.	Formative: Ss give a feedback to the Ss' explanations and corrects their language mistakes.

6	25	Read a text carefully and critically. Formulate text-dependent question. Assume the mantle of a text-editor.	T provides Ss with a text related to the topic, which gives an insight into a more correct theory of lift. The text contains some blank spaces where Ss have to insert a question; each question is addressed in the text itself, directly below the blank spaces. The text-dependent questions that Ss formulate may be open questions, at least partially. Ss also have to insert a text's title and the images' captions. They may use an online dictionary (Wordreference.com), but they cannot visit other websites. The text chosen is more challenging than texts Ss have encountered over other activities, so it requires Ss to think more deeply. At the end of the work Ss read their questions. The T encourages Ss to interact and exchange their own views.	**Skills** L S R W **Key vocabulary** Streamwise, integrate, direction, centre of pressure, Venturi effect, nozzle, skip, deflect. **Communicative structures** You have to perform a backwards test.. Imagine that your question is addressed in the text below the blank space even if not fully….	☒ Whole class ☐ Group work ☒ Pair work ☐ Individual work	• U2_L2_ALL7.docx U2_L2_ALL7* *paper form	Formative: T evaluates how carefully and critically Ss interpret a text.

CLIL Lesson Plan

Unit number	3	**Lesson number**	1	**Title**	Aerodynamics and airfoils

Activity	Timing	Learning Outcomes	Activity Procedure	Language	Interaction	Materials	Assessment

1	10	Activate thinking through a competition. Perform a multiple-choice quiz. Have fun answering the question related to the topic. Retrieve previous learned information.	The T projects the Kahoot main page on the board showing the PIN code. The T previously prepared the activity (Title: What do you know about Airfoils? link: link) and uploaded it on the platform. Using any device with a web browser and internet connection, Ss individually visit the website, input the unique PIN and enter a nickname. Then they take part in the quiz and challenge their classmates. Most of questions are known by the Ss, but some are not: they will serve to make the Ss start thinking about the new topic. During gameplay, T manages the scrolling of questions. Questions, answers and solutions are given in U3_L1_ALL1.	**Skills** L S R W **Key vocabulary** Flap, aileron, trailing edge. **Communicative structures** I don't know how fast you guys are. The goal is to answer correctly as well as to answer fast..	☒ Whole class ☐ Group work ☐ Pair work ☒ Individual work	• U3_L1_ALL1.docx link	

2	15	Identify and take note of key information. Activate prior knowledge.	T presents a slideshow (Aerodynamics and Airfoil, U3_L1_ALL2) to illustrate types and behaviour of airfoils. Throughout presentation, some specific questions are outlined. Ss follow the T's lecture and are free to interrupt at any time in order to ask questions and express opinions; cooperative replies to questions are expected. Ss take notes and keep registering Keywords as in the previous lessons.	**Skills** L S R W **Key vocabulary** Wing, shape, camber, chord, aerodynamic centre. **Communicative structures** Help me with … terminology. Can you identify the relationships…? What for should it be considered as a relevant parameter to…?	☒ Whole class ☐ Group work ☐ Pair work ☐ Individual work	• U3_L1_ALL2.pptx	Formative: T facilitates the discussion and provides feedback on content and terminology.
3	20	Practice the simulator. Discover the simulation environment and program features. Appreciate the value of simulations.	T tells Ss to open a search engine (Internet Explorer or Firefox) and enter the URL: link. Ss, individually, follow the T's instructions and launch the FoilSim III applet. T illustrates the features of FoilSim III (a full description can be	**Skills** L S R W **Key vocabulary** Lift, drag, parameters, plot, altitude, Reynolds number.	☐ Whole class ☒ Group work ☐ Pair work ☒ Individual work	• U3_L1_ALL3.docx FoilSim III Student Version (Java applet)* *Courtesy of NASA Glenn Research Center . Link: link	

found at the given link), and clarifies what the Reynolds number is. This free access Java applet allows Ss to investigate how an aircraft wing produces lift and drag by changing the values of different factors. Ss learn how to use this program by testing, reading instructions, sharing information, asking the T. They can change foil shape, type of object, relative speed, altitude, type of fluid… The simulation calculates the lift and the drag based on the parameters chosen. Various plots illustrating the dependence on some parameters can be drawn. NB: to make sure that it works, the program should be carefully verified before the lesson (installation instructions in U3_L1_ALL3). Be sure that Java is enabled in your browser. In the Java settings add the above URL in the Exception Site List. Note that Java

Communicative structures
What do you think … simulate? Experience the features as much as you can. What do engineers gain from this kind of…?

			doesn’t run appropriately on Chrome. For an offline version of the program check the U3_L1_ALL3 file.				
4	35	Reproduce an experimental process that could be performed in a wind tunnel with the tools provided by a computer program. Collect and process experimental data. Plot graphs and interpret the results of the simulation. Apply what they have learned to understand the behaviour of various airfol shapes.	T provides Ss with an exercise to practice an Aerodynamics simulation with Foilsim. Ss work individually at the PC, but they may ask for T’s support. At the PC, individually, Ss start with the default values and then increase the angle of attack (AOA) from zero in one-degree increments. They experience with the flat bottom airfoil and the flat plate airfoil; in the program panel, they collect the output data (amount of lift, drag, and L/D) and and build graphs in a calculation software (MS Excel, LibreOffice Calc…). More details in U3_L1_ALL4 exercise.	**Skills** L S R W **Key vocabulary** Lift, drag, parameters, plot, altitude, Reynolds number. **Communicative structures** What are the requirements to….? Why is so important to evaluate..? Enter the same data for a wing that might…	☒ Whole class ☐ Group work ☐ Pair work ☒ Individual work	• U3_L1_ALL4.docx	Formative: T checks how Ss run the simulation.

5	20	Collect the relevant knowledge from previous activities. Solve a puzzle clue on the topic. Dig up the specific terminology they have encountered.	T arranges Ss in pairs and provides them with a hardcopy (U3_L1_ALL5), which contains a crossword puzzle related to the topic. The activity, made up of 49 words, was created by the T using a free access online service (link). Throughout activity, the T circulates and facilitates. Ss may ask questions about words they do not fully understand. At the end of the activity they look at the solution (U3_L1_ALL6) and discuss it.	**Skills** L S R W **Key vocabulary** Turbulence, aileron, wind-tunnel, wing-span, stall, stagnation, span, pitch. **Communicative structures** Who’s going to catch the words first?	☒ Whole class ☐ Group work ☒ Pair work ☐ Individual work	• U3_L1_ALL5.jpg • U3_L1_ALL6.jpg	Formative: T provides explanation for the words in the puzzle. Ss may help their classmates as well.

CLIL Lesson Plan

Unit number	3	**Lesson number**	2	**Title**	Lift over an airfoil

Activity	**Timing**	**Learning Outcomes**	**Activity Procedure**	**Language**	**Interaction**	**Materials**	**Assessment**
1	5	Activate the learning and connect to previously learned information. Put elements together to form a coherent whole.	T ask a question: “Which are the factors affecting lift over an airfoil?” (expected answers in U3_L2_ALL1). Ss brainstorm and try to give well-articulated answers to the T. Then they write down their answers on the board. At this stage, the T does not give its opinions but, in order to stimulate Ss’ thinking, he may ask other questions.	**Skills** L S R W **Key vocabulary** Object, motion, air, transmission. **Communicative structures** Guess which factor has a major role. Could you tell me..? Why does lift decrease with Altitude? Can Lift be a problem in car races?	☒ Whole class ☒ Group work ☐ Pair work ☐ Individual work	• U3_L2_ALL1.docx	Formative: T observes the actual Ss’ level of knowledge.

2	10	Fix and strengthen Ss opinions. Collect all the effects, simple and complex, into one single equation. Breaking information into constituent parts and then reassemble them in a mathematical form.	T projects the Lift Equation (U3_L2_ALL2) on the board. All of the information on the factors identified by the Ss is gathered into this single mathematical equation. The T launch a discussion with the aim of fixing the answers that Ss had previously written on the whiteboard. Ss brainstorm and interact with the T; they should try to clear up any doubts on the lift equation.	**Skills** L S R W **Key vocabulary** Dependency, coefficient, density, area. **Communicative structures** As you predicted.... You can see that.... That's the magic in math..	☑ Whole class ☑ Group work ☐ Pair work ☐ Individual work	• U3_L2_ALL2.docx	The T provides ongoing feedbacks on the Ss activity and evaluates how easily they use mathematics to describe physical processes. Ss face up to the topic openly and help each other in the comprehension.
3	20	Perform an Aerodynamics simulation. Use a procedure for simulating a physical process. Discover the dependency of lift and drag from wing area, air	T forms three groups of Ss and assigns them three different tasks (U3_L2_ALL3, U3_L2_ALL4 and U3_L2_ALL5) to be performed with the FoilSim simulator. Group A studies the relationship between wing area and lift, Group B between	**Skills** L S R W **Key vocabulary** Lift, drag, density, airspeed, dependency, wing area.	☑ Whole class ☑ Group work ☐ Pair work ☐ Individual work	• U3_L2_ALL3.docx • U3_L2_ALL4.docx • U3_L2_ALL5.docx Ms Excel or LibreOffice Calc	Formative: T checks how Ss run the simulation and invite Ss to discuss the simulation procedures.

		density and air speed.	airspeed and lift and Group C between air density and lift. Ss need 1 PCs for every group, running FoilSim and a spreadsheet program (MS Excel, LibreOffice Calc or OpenOffice Calc). Ss start by setting the same conditions in the program and run the simulation they were given (more details in the worksheets). They record data, build graphs and, at this point, they state the relationship between the physical parameters they were assigned. When Ss have finished, their briefly present their findings to the class and the T coordinates the discussion.	**Communicative structures** What happens if….? How do you expect….may affect…?			

4	15	Add other elements to the understanding of Aerodynamics. Put the new concepts toghether with previous knowledge to form a functional whole.	T presents a slideshow (Effect of viscosity, U3_L2_ALL6), about the behaviour of airfoils in flying conditions (viscosity, turbulence, stall...). The slides are structured as a series of questions/ answers. Ss follow the T's lecture and are free to interrupt at any time in order to ask for explanations. As usual, Ss take notes and keep registering the Keywords.	**Skills** L S R W **Key vocabulary** Inviscid, viscous, frictionless, stall, separation, turbulent, lamina, transition, outer layer, boundary. **Communicative structures** Can viscosity be neglected? Do all real... have..? What causes flow separation? What do you think about this phenomenon?	▣ Whole class ☐ Group work ☐ Pair work ☐ Individual work	• U3_L2_ALL6.pptx	The T assesses the participation of Ss and looks for ways to stimulate involvement and interaction. Since the topic is anything but easy, the T tries to promote positive motivational beliefs.

5	50	Evaluate what Ss have learned about the Aerodynamics simulation with Foilsim. Verify the outcomes of the instruction.	T provides Ss with a question sheet that Ss fill after they have performed a simulation with Foilsim. The task contains guidance on how to perform the simulation and which parameters to find out. At the end of the activity, Ss deliver their worksheets to the T. They will be graded on the basis of the marking grid reported in U3_L2_ALL7. Correct answers can be found in U3_L2_ALL8.	**Skills** L S R W **Key vocabulary** Reset, camber, curvature, chord, feet, thickness. **Communicative structures** You don't have to use imagination.. ...just follow instructions.	☐ Whole class ☐ Group work ☐ Pair work ☒ Individual work	• U3_L2_ALL7.docx • U3_L2_ALL8.docx U3_L2_ALL7 in paper form. FoilSim III Student Version (Java applet) - link .html	Summative. By performing the test, Ss will possibly get a sense of what they have learned. The T collects the results of the test and evaluates the success of the last two lessons.

CLIL Lesson Plan

Unit number	3	**Lesson number**	3	**Title**	Design of an airfoil

Activity	**Timing**	**Learning Outcomes**	**Activity Procedure**	**Language**	**Interaction**	**Materials**	**Assessment**
1	3	The T depicts today’s Learning Outcomes: identify the characteristics of an airfoil design, use the NACA codes to generate an airfoil and recognize the main parts of an airplane.	T shows Learning Outcomes on the board.	**Skills** L S R W **Key vocabulary** Plan, schedule, experimental activity, learning outcomes. **Communicative structures** Since you have studied .., now it is time to… You will observe… I expect you to…	☒ Whole class ☐ Group work ☐ Pair work ☐ Individual work		

2	15	Depict and discuss a new topic. Recall previous learned information which is needed to understand an airfoil's behavior. Apply the NACA codes to real examples.	T presents a slideshow (U3_L3_ALL1) to illustrate the NACA code. Throughout presentation, some specific questions are outlined, about the code of WW1 airplanes and the behaviour of airfoils flying upside down. Ss follow the T's lecture and are free to interrupt at any time in order to ask questions and express opinions; they brainstorm and formulate answers to the two given questions. As usually, throughout presentation, each student takes note of the keywords.	**Skills** L S R W **Key vocabulary** Design, cross-section, digit, manoeuvrability, climb, bracing. **Communicative structures** Here is a way to understand.. As a matter of facts, this resulted in higher rates of... What about their NACA codes? What if we turn it upside down?	☒ Whole class ☐ Group work ☐ Pair work ☐ Individual work	• U3_L3_ALL1.pptx	
3	25	Design NACA profiles and evaluate their behaviour.	T makes pairs and provides them with a task described in U3_L3_ALL2. Ss use a online application to generate a 4 digit NACA code and plot the related profile. T helps Ss to understand how to use this application	**Skills** L S R W **Key vocabulary** Shape, generator, ruler, transformation.	☐ Whole class ☐ Group work ☒ Pair work ☐ Individual work	• U3_L3_ALL2.docx link	Formative: T checks the Ss work and provides ongoing feedback.

			and facilitates operations. Ss open the given link and use the NACA 4-digit airfoil generator; here they select a certain airfoil and plot its shape. After that, Ss decide whether to choose from a database list of profiles or add their own airfoils; they may change the airfoil parameters as they please. With the chosen 4-digit NACA codes, each pair of Ss generate three airfoils and print them on paper sheets (one airfoil per page); they have to fill the page in order to allow the image to be well analysed. The T underlines that Ss have to store the NACA codes but they don't have to write any note on the paper. If sufficient time is available, Ss have a look at the graphs generated by the online application (lift against angle and lift against	**Communicative structures** Plot the shape of the airfoil for your… You may choose from a database list or add you own airfoils. Print the airfoil shape directly from the window. Don't print the airfoil data on the image!				

			drag) and try to understand how these relationships depend upon the airfoil shape.				
4	15	Predict the NACA code from a graphical representation of an airfoil. Apply the meaning of NACA parameters in real time.	T ask every pair of Ss to give its own 3 printed airfoils to another pair. Every pair of Ss analyses the 3 airfoils designed by another pair. Ss use a ruler and try to guess which are the NACA codes of the airfoils they were given. Full details can be found in U3_L2_ALL3. If needed, the T may project the meaning of the 4 digit NACA code (from U3_L3_ALL1).	**Skills** L S R W **Key vocabulary** Ruler, draw. **Communicative structures** Use a ruler and try to guess wihich are the NACA codes of the airfoils you were given.	☐ Whole class ☐ Group work ▣ Pair work ☐ Individual work	• U3_L3_ALL3.docx • U3_L3_ALL1.pptx	

5	15	Check results of the previous activity. Provide feedback on each other.	Ss verify the NACA codes they have identified for each of the 3 airfoils. They open the link link, go to the NACA 4 digit airfoil generator and enter these codes; Ss should be able to understand whether their findings are correct by simply looking the images. As a last check, Ss ask their classmates, who know the answers, and compare their results.	**Skills** L S R W **Key vocabulary** Camber, curvature, chord, feet, thickness. **Communicative structures** With a simple look you should be able to... Do they correspond? Ask your colleagues!	☐ Whole class ☒ Group work ☒ Pair work ☐ Individual work	link	Formative: T assess how Ss operate and communicate. Ss correct their classmates' exercises (peer-correction).

6	12	Find relationships between airplane parts and functions. Search for information related to the topic. Remember the word for each airplane's part.	T projects the picture (U3_L3_ALL4) and arranges Ss in pairs. They have to connect the Airplane parts to the functionalities depicted in the picture. They can use Internet if they want. The T underlines that Ss should memorize the names of the airplane parts, since they will be used in the next activity (written test). At the end of the work the T projects the solution (U3_L3_ALL5) and discuss it with Ss.	**Skills** L S R W **Key vocabulary** Stabilizer, Rudder, elevator, flap, aileron, spoiler, slat, fuselage, cockpit, winglet, engine, payload. **Communicative structures** Can you identify the different parts of an airplane? Each part plays a fundamental role in the behaviour...	☒ Whole class ☐ Group work ☒ Pair work ☐ Individual work	• U3_L3_ALL4.jpg • U3_L3_ALL5.jpg	The T oversees the activity. Ss may help their classmates to clarify the role of various aircraft’s parts.

7	15	Verify what the Ss have learned.	The T provides Ss with a written test (U3_L3_ALL6) and projects a picture (U3_L3_ALL7) on the board. Part of the test concerns this picture. In the worksheet, the marking grid is reported, too. Ss watch the board and answer the questions on the sheet they were given. The keys are given in U3_L3_ALL8.	**Skills** L S R W **Key vocabulary** Camber, curvature, chord, feet, thickness. **Communicative structures** With a simple look you should be able to...	☐ Whole class ☐ Group work ☐ Pair work ☒ Individual work	• U3_L3_ALL7.jpg • U3_L3_ALL6.docx U3_L3_ALL6 paper form U3_L3_ALL7 projected	Summative: the T evaluates what Ss have learned over the last activity in terms of concepts and vocabulary.

CLIL Lesson Plan

Unit number	3	**Lesson number**	4	**Title**	Conclusion

Activity	**Timing**	**Learning Outcomes**	**Activity Procedure**	**Language**	**Interaction**	**Materials**	**Assessment**
1	3	Get a picture of the current lesson plan and activities.	The T shows the current lesson plan (U3_L4_ALL6) and encourage Ss to keep taking note of the Keywords. As regard to the last part of the Lesson, the T tells the Ss to consider the totality of the course's lessons.	**Skills** L S R W **Key vocabulary** Plan, schedule, experimental activity, learning outcomes. **Communicative structures** We have almost reached the finish line. I think that we have done a good job..don't we? Today we are going to .. There will be a challenge ...	☑ Whole class ☐ Group work ☐ Pair work ☐ Individual work	• U3_L4_ALL6.pdf	
2	15	Make paper airplanes and understand	Ss create a paper airplane with the aim of making the flight time as long as possible. T	**Skills** L S R W	☑ Whole class ☐ Group work	• U3_L4_ALL1.docx U3_L4_ALL1 in paper form To build the	Formative: T checks the Ss work and provides

		their functioning. Think about how to improve the airplane lift.	instruct Ss to use a A4 sheet, scissors, tape and glue. Ss work individually at their desks but exchange views about what to do and what not to do. They also choose a color to mark their plane and make it recognizable. Ss who finish early can write a hypothesis about how far their plane will fly and support their hypothesis with information about their plane. When they have finished, Ss go to an open space and, one at a time, challenge each other flying their own rockets. The T measures the flight time by means of a stopwatch and evaluates the distance each plane has flown with a tape measure. Throughout the competition, Ss create a chart (U3_L4_ALL1) listing the features of their own plane (is it large, small, medium, are the wings long, short, etc.) and performance (flight time and distance).	**Key vocabulary** Scissor, glue, hypothesis, flight time, shape, challenge. **Communicative structures** How do you think a good paper airplane is made? Did you play with airplanes when you were kids? Your goal is to create a rocket.	☐ Pair work ☐ Individual work	airplanes: A4 paper sheets, scissors, glue, tape. To measure: stopwatch, tape measure.	some guidance.

3	10	Understand how to improve the paper airplane’s performance. Realise what they didn't consider in the building of their airplanes.	T projects two movies (see the YouTube links): the first one concerning the Guinness World record for time aloft – 27.6 seconds; the second one showing a tutorial to create this paper airplane. The T may help Ss to understand the movies content. Ss watch the movies carefully and ask for explanations if they need them.	**Skills** L S R W **Key vocabulary** Airtime, record, path, appeal. **Communicative structures** This is the paper airplane Mr … used when he made the world record. Sure, the total time wins records, but the actual flight was not appealing at all..	☐ Whole class ☑ Group work ☐ Pair work ☐ Individual work	link link Both accessed on March, 2018	

4	20	Implement strategy and tricks to improve the paper airplane performance. Apply what they have just learned from the instructional movie.	Ss make a new, well-performing paper plane. They use the information they have learned from the movie and search other tips on the Web, if they want to. Again, Ss work individually but may want to share opinions and suggestions. They have to fill the task in about 10 min. After that Ss go to an open space and challenge each other; for each flight, the T measures flight time and distance. Ss update the chart (U3_L4_ALL1) with the new data and the strategy they have adopted. At the end the T stimulates discussion with questions like: What do you notice? What about the airfoil shape? Why has ... won? Is weight forward is good? Why paper airplanes look different than real planes?	**Skills** L S R W **Key vocabulary** Detail, trick, dare. **Communicative structures** Now apply what you have just learned. What do you notice? What about the airfoil shape?	☒ Whole class ☐ Group work ☐ Pair work ☒ Individual work	• U3_L4_ALL1.docx U3_L4_ALL1 in paper form For building the airplanes: A4 paper sheets, scissors, glue, tape. For measuring: stopwatch, tape measure.	

5	20	Brainstorm and draw up a summary of what Ss have learned. Discuss and agree the most relevant terms that describe the path marked out in this course.	T tells Ss to pick up their notes with the Keywords. Ss as a group gather around a PC make a list of the 20 most important Keywords they have encountered throughout the course. All Ss pick up their notes and contribute to create the list; keywords are listed according to the relevance criterion that Ss agree on. The T check whether all Ss have noted Keywords and collaborate to the activity.	**Skills** L S R W **Key vocabulary** Overview, concur/agree, pluck. **Communicative structures** Take out your notes ..pluck your keywords. Wrap your heads around this.	☑ Whole class ☐ Group work ☐ Pair work ☐ Individual work	Ss' Keyword list	Summative: the T evaluates how Ss managed to collect the keywords for each lesson.

6	15	Identify a common thread over the previous lessons. Connect Keywords to their meaning. Verify how Ss have taken the keywords on board over the previous 10 lessons.	The T gives each S a worksheet (U3_L4_ALL2) with 30 sentences and the related marking grid. For every sentence, the S insert a keyword that he thinks may appropriately match the required meaning. Most of these Keywords should be taken from the list created by the Ss themselves, which is projected on the board. The correct answer are given in U3_L4_ALL3. While the Ss do the exercise, the T complete the assessment form (U3_L4_ALL4) concerning the Ss participation to course's activities. At the end of the work, the Ss deliver their worksheets to the T.	**Skills** L S R W **Key vocabulary** Synonymously, unopposed, exert, tendency, orifice, vicinity. **Communicative structures** Communicative structures Let's see whether your Keywords match the gaps. Did you catch some of these words?	☐ Whole class ☐ Group work ☐ Pair work ☒ Individual work	• U3_L4_ALL2.docx • U3_L4_ALL4.docx • U3_L4_ALL3.docx U3_L4_ALL2* U3_L4_ALL3 U3_L4_ALL4** Ss' Keyword list projected *paper form **for the T only	Summative: the T evaluates what the Ss have learned about the course's content and the related keywords.

7	15	Ss give an honest assessment and tell their own ideas about the course. The T collects the Ss opinions about how the course has been developed. Discuss any business.	The T provides the Ss with a rubric (U3_L4_ALL5) for evaluating the course. Each S fills the rubric and writes down opinions, comments and aspects that should be improved. At the end of the activity, the Ss and the T discuss the conclusions and any other business. Hopefully, this will provide both the T and Ss with a trajectory and sense of completion.	**Skills** L S R W **Key vocabulary** Engagement, attractiveness, effectiveness, suggestion. **Communicative structures** Now it's time to take stock of... I hope you really may be as honest a s.. This will be useful both for me and ..	▣ Whole class ☐ Group work ☐ Pair work ▣ Individual work	• U3_L4_ALL5.docx	Summative: Ss give a feedback to the T about the course and his teaching methods; the T ask Ss whether the course has met their expectations and which adjustments could be adopted.