CLIL Module Plan

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School	Liceo Scientifico Leonardo da Vinci, Trento				
School Grade	○ Primary		○ Middle		◉ High
School Year	○ 1	○ 2	◉ 3	○ 4	○ 5
Subject	Matematica	**Topic**	Exponential functions		
CLIL Language	◉ English		○ Deutsch		

Personal and social-cultural preconditions of all people involved	The scientific high school “Leonardo da Vinci” is located in Trento. It proposes two curricula, the ordinary scientific curriculum and the applied sciences scientific curriculum, in which computer science replaces latin, and natural sciences are boosted. The class follows the applied sciences curriculum; it consists of 22 students. There is only one student who does not have Italian as first language. The academic performance of the class in scientific subjects is average, in English language it is above average. The average level of the class corresponds to B2. Four students plan to study abroad next year. The behaviour of the students is mostly polite, although many students tend to loose attention quickly. The level of participation varies highly: a small group of students are willing to learn and to be an active part of lessons, while a specular group has little interest and motivation. The majority of students shows an interest in the middle of the two extremes. Teaching is often challenging due to the various levels of interest, participation and level of performance of the students. Students have limited previous experiences of CLIL, having had a module of about 10 hours in natural science. They found it interesting because classes required more participation than usual. They report that science in English was quite hard because of the many new words they had to learn. Two students have special needs. One of them is very interested in mathematics and has very good performance. The other one often needs more time to complete tasks. The mathematics teacher who will carry out the CLIL Module (“T” in the Module Plan) knows the students since last year. She has been teaching mathematics (and sometimes physics) in high school since four years. Previously, she has taught at university in Italian, German and English. She has a C1 certification in English.

Students' prior knowledge, skills, competencies	Subject	Language
	Students learnt basic functions (line, parabola, etc.) last year and know how to graph them in the Cartesian plane. They already know the properties of exponents.	Students understand the main concepts of a new video; they may need to watch it two or three times to get the details. They understand a mathematical explanation at the blackboard, following the discourse connected to the computations or logical deductions written in mathematical notation. They are able to ask questions, although they may not know the mathematical terms. However, most of subject-specific vocabulary is very similar to Italian. They can take notes in English while listening and answer simply open questions.

Timetable fit	◉ Module	Length 10 hours (3 Units)

Description of teaching and learning strategies	The learning and teaching objectives are disciplinary-specific, transversal and communicative. The lessons have been designed to encourage the development of problem solving, critical thinking, collaboration. The methodological approaches will be various, in order to meet different learning styles and to promote the development of different skills: interactive lessons, group or pair work. individual work. During the “student-centered” activities the teacher will act as facilitator and guide. Interaction and communication will be promoted during the lessons as much as possible by the teacher, who will ask questions and invite students to comment or express their idea, and by group or pair works. During these activities, the teacher will circulate and model language, concepts and cognition. During most activities a formative assessment by the teacher is provided and/or a peer- or self-evaluation is encouraged. Timing is mostly on the lower end. More exercises are needed to help the students fix the concepts. Such exercises can be assigned as homework and checked in classroom, and/or be used to give oral marks, and/or can be solved in group or pair work.

Overall Module Plan

Unit: 1 Exponential growth **Unit length:** 5 h	**Lesson 1** Rice on a chessboard
	Lesson 2 Exponential models
	Lesson 3 Exponential models for real situations

Unit: 2 Graphs of exponential functions **Unit length:** 2 h	**Lesson 1** Graphing exponential functions
	Lesson 2 Estimating exponentials

Unit: 3 Exponential equations **Unit length:** 3 h	**Lesson 1** Properties of exponents
	Lesson 2 Solving exponential equations
	Lesson 3 More exponential equations

CLIL Lesson Plan

Unit number	1	**Lesson number**	1	**Title**	Rice on a chessboard

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

1	2 h	Interpret a story in a mathematical way Write the table of powers of 2 Get a sense of exponential growth Find ways to visualize and approximate big numbers Draw a graph of an elementary exponential function	a) T introduces and explains the motivations to the CLIL Module “Exponential functions". T explains the activities, gives the handout and presents it. b) T shows a video, divided in parts. For each part: - Students listen and fill in the gaps in the video script (individual work). - When the video is paused, a student reads the script and the whole class checks their answers. T encourages discussion if there are questions or mistakes. - Students work in pairs to answer questions. T walks round and helps the pairs through hints or short explanations. A pair presents their answers at the blackboard. The whole class interacts to check the correctness and to compare their own solutions. c) T assigns homework	**Skills** L S R W **Key vocabulary** **Communicative structures**	☑ Whole class ☐ Group work ☑ Pair work ☑ Individual work	• U1_L1_ALL1.pdf • U1_L1_ALL2.pdf ALL1 is the handout with the video script, the questions and vocabulary. ALL2 is the proposed homework.	Formative: T walks round, checks and facilitates. Self-assessment: each student checks their own answers.

CLIL Lesson Plan

Unit number	1	**Lesson number**	2	**Title**	Exponential models

Activity	**Timing**	**Learning Outcomes**	**Activity Procedure**	**Language**	**Interaction**	**Materials**	**Assessment**
1	20'	Draw, describe and use a table of powers, with any base and non negative exponents Understand the characteristic property of the exponential function	a) Students draw a table of powers, as they did in the last lesson and in the homework. A student draws it on the blackboard and explains the rules to move inside it. T checks, helps, facilitates. Students read and complete the handout. b) T explains the characteristic property of the exponential function. Students take notes on the handout.	**Skills** L S R W **Key vocabulary** function, exponential **Communicative structures** moving one step to the right means to ...	☒ Whole class ☐ Group work ☐ Pair work ☒ Individual work		

2	30'	Use the characteristic property of exponential functions Use a calculator or a spreadsheet to compute exponentials Work out a real-life example	Students work in small group on a problem from physics. T checks, facilitates, gives feedback.	**Skills** L S R W **Key vocabulary** decay, radioactivity, mass, percentage **Communicative structures**	☐ Whole class ☒ Group work ☐ Pair work ☐ Individual work	• U1_L2_ALL2.pdf	

CLIL Lesson Plan

Unit number	1	**Lesson number**	3	**Title**	Exponential models for real situations

Activity	**Timing**	**Learning Outcomes**	**Activity Procedure**	**Language**	**Interaction**	**Materials**	**Assessment**
1	2 h	Recognize phenomena that can (or can not) be modelled using exponential functions Solve problems involving exponential functions Use a calculator or a spreadsheet to compute exponentials Handle exponential formulas	Students work in groups to solve problems. T facilitates, answers questions, gives hints. Some students presents their solutions to the whole class, the class participates in the discussion. T checks. Timing can vary depending on which problems are chosen and whether some are given as homework.	**Skills** L S R W **Key vocabulary** **Communicative structures**	☒ Whole class ☒ Group work ☐ Pair work ☐ Individual work	• U1_L2_ALL1.pdf	Formative. T can assess the group work and/or the presentations of the solutions.

CLIL Lesson Plan

Unit number	2	**Lesson number**	1	**Title**	Graphing exponential functions

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

1	30'	Activate previous knowledge on graphs Learn words in English	T has a box containing some cards, each with a word about graphs written on it. The class is divided into two teams. In turn, one student picks a card. Without speaking, he/she has to make his/her team guess the word within one minute. He/she writes or draws at the blackboard and can use gestures. If the team does not guess right or when the time is over, the other team can give an answer. Teams earn one point for each correct answer. T checks correctness, uses a stopwatch to check the time, writes the words after the students guessed them. After the activity a list of words is on the blackboard. Each student receives a handout with a short text to compete using some of the words (see attachment).	**Skills** L | S | R | W **Key vocabulary** See attachment **Communicative structures**	☒ Whole class ☐ Group work ☐ Pair work ☒ Individual work		Formative

2	40'	Graph an exponential function. Describe its main properties.	In pairs, students follow the handout. T facilitates	**Skills** L S R W **Key vocabulary** **Communicative structures**	☐ Whole class ☐ Group work ☑ Pair work ☐ Individual work	• U2_L1_ALL2.pdf	Formative

CLIL Lesson Plan

Unit number	2	**Lesson number**	2	**Title**	Estimating exponentials

Activity	**Timing**	**Learning Outcomes**	**Activity Procedure**	**Language**	**Interaction**	**Materials**	**Assessment**
1	60'	Using the graph of an exponential function to give estimates of non-integer powers of 2.	Students work in pairs to solve the problems in the handout. T facilitates.	**Skills** L S **R** W **Key vocabulary** **Communicative structures**	☐ Whole class ☐ Group work ☑ Pair work ☐ Individual work	• U2_L2_ALL1.pdf This activity was proposed in Italian by Luciano Cappello and Sandro Innocenti, teachers at Liceo da Vinci, Trento.	Formative

CLIL Lesson Plan

Unit number	3	**Lesson number**	1	**Title**	Properties of exponents

Activity	**Timing**	**Learning Outcomes**	**Activity Procedure**	**Language**	**Interaction**	**Materials**	**Assessment**
1	20'	Review basic vocabulary, review the properties of exponents	T hands out the reference sheet "Properties of Exponents". Students complete the sheet. T checks correctness.	**Skills** L S R W **Key vocabulary** power, base, exponent **Communicative structures**	☒ Whole class ☐ Group work ☐ Pair work ☒ Individual work	• U3_L1_ALL1.pdf Material taken from link and link	

2	40'	Use the properties of exponents (review)	T explains the activity and hands out the list of tasks (a grid of 20 exponent rule problems) and the answer cards (A, B, C, D, E). T shows the tasks (one each minute). Students compute and give answers by lifting the corresponding card. If not all students got it right, T reviews the properties and explains the computations in detail.	**Skills** L S R W **Key vocabulary** **Communicative structures**	☒ Whole class ☐ Group work ☐ Pair work ☒ Individual work	• U3_L1_ALL2.pdf	For each task T checks how many students did the computation right.

CLIL Lesson Plan

Unit number	3	**Lesson number**	2	**Title**	Solving exponential equations

Activity	**Timing**	**Learning Outcomes**	**Activity Procedure**	**Language**	**Interaction**	**Materials**	**Assessment**
1	25'	Solve basic exponential equations by tranforming both sides in a power with the same base	T shows the video at link. T pauses the video before some computations/applications of exponent rules and asks students how they would proceed. Students listen, take notes and interact. T shows parts of the video again if the students missed something. After the video, T proposes a similar equation and asks students to solve it. T walk around and facilitates. After the students got their solutions, one of them shows it at the blackboard.	**Skills** L S R W **Key vocabulary** **Communicative structures**	☑ Whole class ☐ Group work ☐ Pair work ☑ Individual work		

2	20'	Solve exponential equations	Students work in pairs to complete the tasks at link T facilitates. In the online activity students also find hints and complete solutions.	**Skills** L S R W **Key vocabulary** **Communicative structures**	☐ Whole class ☒ Group work ☐ Pair work ☐ Individual work		

CLIL Lesson Plan

Unit number	3	**Lesson number**	3	**Title**	More exponential equations

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

1	50'	Review of how to use exponent rules and how to solve exponential equations	T shows a Kahoot quiz. Students work individually and give their answers on their smartphone/tablet/computer (20'). After students submitted their answers and got the results, they are then encouraged to explain their solutions at the blackboard. T helps with the language, if need be, and checks that every student understands their mate's solutions.	**Skills** L S R W **Key vocabulary** **Communicative structures**	☒ Whole class ☐ Group work ☐ Pair work ☒ Individual work	• U3_L2_ALL1.pdf The quiz can be used from Quizizz, it is available at the link link	This is a quiz: students get a feedback based on how many answers they got right. T sees the results of the whole class in the full report. T can check which students have more difficulties and which questions were not correctly worked out. T can then work towards these specific needs.