CLIL Module Plan

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School Grade	○ Primary		◉ Middle		○ High
School Year	○ 1	○ 2	◉ 3	○ 4	○ 5
Subject	Biologia		**Topic**	Genetics	
CLIL Language	◉ English		○ Deutsch		

Personal and social-cultural preconditions of all people involved	The class is composed of 23 pupils (14 males and 9 females) coming from different municipalities (population ranging from about 1500 to 5000). Seven of the pupils have learning disabilities: two of them fall under the 104/1992 law and are assisted by appropriate support teachers; five more pupils have specific learning disorders (DSA band B, one in C), in particular dyslexia e dysgraphia. Two of the pupils are one year older than others having repeated the first class. As far as skills and abilities across disciplines are concerned, the class is divided into two groups: a group of students is able to grasp with a certain ease the contents and to re-elaborate them; a second group shows appreciable learning difficulties (due mainly to dyslexia and dysorthography). Some of the latters, probably as a result of such difficulties, and a couple of the other pupils show lack of commitment, being often distracted and with uncooperative attitude, sometimes making lessons very difficult even when involved in cooperative tasks. According to the English teacher, most of the students attain a A1 band, only some attain the A2 band.

Students' prior knowledge, skills, competencies	Subject	Language
	The class has limited knowledge about genetics and heredity, having being introduced to the topic only briefly by the main teacher during two previous lessons. Some of the contents of this module make use of some concepts and knowledge that the class has however learned in the past years, such as the biology of the cell. The class has already been involved in a CLIL module during the second year (biology, in German). This experience was quite successful, according to the teacher, although the contents had to be reduced compared to the original (Italian). Pupils have previously experienced lessons that included cooperative group working, however this has often not worked out very well because of the inability to organise themselves and to focus on the lesson and tasks.	They have fair knowledge of simple present and simple past constructions, as well as the imperative form. Specific vocabulary regarding the topic of the module is however very limited.

Timetable fit	◉ Module	Length 20 h

Description of teaching and learning strategies	This module makes large use of cooperative learning and task-based learning. Lesson plans have been designed to integrate frontal lessons and group or pair work, and rely on a constant interaction between teacher and pupils and especially among pupils. The teacher should encourage as much as possible students to think about what they are learning and listening to, to ask as many questions as possible and to answer and express their thoughts freely. For this reason the time indicated for the various activities should be considered as indicative, as I think that each class and lesson should be as free to develop as possible. Rather than task driven, the lesson should be curiosity driven (avoiding however inappropriate and out of topic questions and comments should be dismissed) and the teacher should convey the joy of learning by being active and enthusiast about the topic. Many of the materials used in this module consist of presentations to be used with the interactive whiteboard (LIM) or a projector: slides should not be considered as self-explicative and exhausting in their contents, but as a support for both teacher and students during the lesson. For this reason most of the hand-outs contain information present in the slides that is integrated by student's activities and will then constitute the materials used for learning. Moreover, there should be flexibility on the questions to be asked to students: while some are required by the lesson plan (for instance when they shall introduce the next topic), the teacher should adjust the questions according to the students' interests. This module is content based and English is actively used by students mainly by listening and speaking. Depending on the L2 language level and the class commitment to the topic, the teacher could use L1 (code switching) whenever this helps students to feel at ease with the lesson.

Overall Module Plan

Unit: 1 Mendel **Unit length:** 5	**Lesson 1** We are genes
	Lesson 2 What is a trait? Mendel’s principles of inheritance 1
	Lesson 3 Mendel’s principles of inheritance 2
	Lesson 4 Mendel’s principles of inheritance 3
	Lesson 5 Wonder Birds

Unit: 2 Heredity **Unit length:** 4	**Lesson 1** What is inheritance: mitosis
	Lesson 2 What is inheritance: meiosis
	Lesson 3 What do we inherit?
	Lesson 4 Intermediate assessment: Mendel and heredity

Unit: 3 DNA, proteins and genetics **Unit length:** 9	**Lesson 1** What are DNA and genes?
	Lesson 2 Where is my DNA?
	Lesson 3 Lab experience: DNA extraction
	Lesson 4 About genes and proteins
	Lesson 5 The language of genes: grammar
	Lesson 6 The language of genes: syntax
	Lesson 7 Let's translate!
	Lesson 8 Assessment: DNA and genetics

Unit: 4 Genetics and evolution **Unit length:** 2	**Lesson 1** Bacteria evolution
	Lesson 2 What is evolution? An abstract

CLIL Lesson Plan

Unit number	1	**Lesson number**	1	**Title**	We are genes

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

1	10	Knowledge: Who are you? Comprehension: What does make you different from your classmates and from your brother/sister/mother/father? Students will focus on both similarities and differences among them. This information is useful to introduce the notion of inheritance and the genetic basis of the phenotype that will be analyse in detail during the next lessons.	The teacher asks pupils to observe themselves and, for instance: Look at your classmates: do you all look the same? Do you all have the same behaviours/tastes? Are you more similar to your father or to your friend? Show slides 1 to 2 of U1_L1_ALL1. Here and in all other lessons of this and other units the teacher should use the supporting material (videos, presentations, hand outs) to stimulate the curiosity of students. When mentioning “information” (see slide 2), specify that you will be talking in detail about this in the next lessons.	**Skills** L S R W **Key vocabulary** Variation; trait; characteristic; **Communicative structures** I have ...., while my friend has .... The difference between me and my brother is	☒ Whole class ☐ Group work ☐ Pair work ☐ Individual work	• U1_L1_ALL1.pptx	Ongoing assessmer

2	10	Knowledge: observe people and describe their features	Teacher briefly introduces what a trait is (Use slide 3 of U1_L1_ALL1), then ask students to complete the activity table sheet (U1_L1_ALL2) by adding the relevant trait versions of a classmate. For instance, students should ideally ask their friends “Is your hair curly or straight?”, or “Do you have dimples?” etc. Ask them to complete it at home while observing a relative (father, mother, sister etc).	**Skills** L S R W **Key vocabulary** **Communicative structures** Is your ....? Do you have .... ?	☐ Whole class ☐ Group work ☑ Pair work ☐ Individual work	• U1_L1_ALL1.pptx • U1_L1_ALL2.pptx	Ongoing assessmer feedback from students

3	5	Comprehension: use observations to compare physical and behaviour.erve people and describe their features	Teacher asks the following questions. 1. What do you observe? 2. Are we all the same? 3. How many traits differ between you and your friend? 4. Do you think you look more like your friend or your mother? Possible answers/observations include: We all are different, although some (but not all) characters/traits are identical between me and my friend. We look more like our parents	**Skills** L S R W **Key vocabulary** **Communicative structures** I observe that .... The difference between .... I have .... S/he has ...	☒ Whole class ☐ Group work ☐ Pair work ☐ Individual work	• U1_L1_ALL1.pptx	

4	5	Comprehension: understand what a “trait” is in genetics	Use slides 5 to 8 of U1_L1_ALL1. Teacher points out that a trait (or character) is something we can observe. For example: … ... what have you observed? Expect students to understand that a trait is not a version of such character (for example it could be the “eye colour”, but NOT “blue” or “brown”)	**Skills** L S R W **Key vocabulary** **Communicative structures** I have observed that ...	☒ Whole class ☐ Group work ☐ Pair work ☐ Individual work	• U1_L1_ALL1.pptx	feedback from students

5	10	Comprehension: what makes us different one from another, yet all different from a chimpanzee.	Use slide 9 of U1_L1_ALL1. Teacher asks students to write down some traits that can be used to compare us (humans) from chimpanzees. What are the traits and which versions of these traits do you expect to observe? Students should become more familiar with the concept of trait and of trait versions. Also, they will begin to understand that some traits are valid to differentiate among humans but not among other species (there are no chimpanzees with long blond hair and blue eyes)	**Skills** L S R W **Key vocabulary** **Communicative structures** What are the traits and which versions of these traits do you expect to observe?	☒ Whole class ☐ Group work ☐ Pair work ☐ Individual work	• U1_L1_ALL1.pptx	

6	10	Knowledge and Comprehension: questions from students about the lesson.	Ask students whether there are some doubts, observations that they would like to share.	**Skills** L S R W **Key vocabulary** **Communicative structures** What have you learned? What did you not understand?	☒ Whole class ☐ Group work ☐ Pair work ☐ Individual work		feedback from students

7	At home	Knowledge: get familiar with some word that will be used throughout the module.	Ask students to complete the word search activity (U1_L1_ALL3) at home as homework. These words, as well other terms and concepts that will be used in the lessons, could be used to complete a word bank (U1_L1_ALL4) that can be set up by students at this point of the module (print the first example sheet and then ask them to copy this into a notebook at home. The same structure – English term, Italian term, notes (examples) – will be used for all specific terms that they will encounter along the module)	**Skills** L S **R** **W** **Key vocabulary** **Communicative structures**	☐ Whole class ☐ Group work ☐ Pair work ☒ Individual work	• U1_L1_ALL3.pptx • U1_L1_ALL4.xlsx	self assessmer

CLIL Lesson Plan

Unit number	1	**Lesson number**	2	**Title**	What is a trait? Mendel’s principles of inheritance 1

Activity	**Timing**	**Learning Outcomes**	**Activity Procedure**	**Language**	**Interaction**	**Materials**	**Assessment**
1	3	Knowledge: what is a trait	Use slide 1 of U1_L2_ALL1 Introduce the theme of the lesson: What is a trait? How does it pass from parents to offspring? Ask students what they remember about last lesson, in particular if they can name some traits.	**Skills** L S R W **Key vocabulary** trait; parents; offspring; **Communicative structures** An example of trait is ...	☑ Whole class ☐ Group work ☐ Pair work ☐ Individual work	• U1_L2_ALL1.pptx	
2	5	Knowledge: a trait is... Comprehension: use traits to distinguish between	Use slides 2 to 5 of U1_L2_ALL1 Go through the slides: in slide 2 ask if they	**Skills** L S R W	☑ Whole class ☐ Group work ☐ Pair work	• U1_L2_ALL1.pptx	

		physical appearances	can identify the parents (mother and/or father) of the two puppies. Examples: -Can you describe the puppies? -What is it similar between them and their parents? -Do you agree with what you see in this slide? Check with slide 3. Ask students why they made that choice: they can write that down (allow 2 minutes), then report to the entire class. Students should identify some traits and the associated trait versions that distinguish the two set of parents-offspring. Go to slide 4 and see	**Key vocabulary** trait version: descendants; inheritance **Communicative structures** Both puppies and their parents have/are ...	▣ Individual work	

			if they agree. Ask students why puppies resemble their parents and not the other dogs (because they have inherited the trait versions). Go to slide 5 and make sure that they do understand the concept of inheritance: parents pass the trait version to their offspring.				

3	3	Knowledge: what is a pea, who is Mandel, what has he done	Use slides 6 to 7 of U1_L2_ALL1 How is a trait (version) passed from parents to offspring (or children)? Introduce Mendel and the peas. Ask if they can identify some traits of peas (slide 7): they should point to flower colour, pea colour, pod form.	**Skills** L S R W **Key vocabulary** offspring=descendants=children; **Communicative structures** How does that happen? Can you identify some traits of peas?	☒ Whole class ☐ Group work ☐ Pair work ☐ Individual work	• U1_L2_ALL1.pptx	
4	4	Knowledge: what are peas traits	Use slides 8 and 9 of U1_L2_ALL1 Revise with students the concept of trait (slide 8) and trait version (slide 9). Focus on seed (cotyledon) color (will be used later).	**Skills** L S R W **Key vocabulary** seed; pod; stem **Communicative structures**	☒ Whole class ☐ Group work ☐ Pair work ☐ Individual work	• U1_L2_ALL1.pptx	

5	10	Knowledge and comprehension: How Mendel's pea plants helped us understand genetics; why an allele is called recessive or dominant	Use slides 10 and 11 of U1_L2_ALL1 and U1_L2_ALL2 Tell students that they have to complete the text (give U1_L2_ALL1 as handout to each student) after having watched a video; explain them that the empty circles represent peas and that they will have to color them in a second time (see activity 7). Explain meaning of breeding (in this case, raising and reproducing plants), hybrid (the descendants of two different plants),	**Skills** L S R W **Key vocabulary** Inheritance; heredity; generation; descendant; breeding; hybrid; purebred **Communicative structures** I think that ...	☐ Whole class ☐ Group work ▣ Pair work ▣ Individual work	• U1_L2_ALL1.pptx • U1_L2_ALL2.pptx	self assesment;

			purebred (plants that always produce identical descendants) Watch the video of slide 11 twice (remember stopping the video at 1:10; recommended: use subtitles and set speed to 0.75). Students may be allowed to double check with their classmate if they have completed the text in the same way. Ask one or more students to read the text. Ask the class if the do agree with her/him. Then move to slide 12 of U1_L2_ALL1 and let them correct their text. Ask them				

			if they understand why a trait is defined as dominant or recessive.				
6	10	Knowledge: what are dominant and recessive alleles Comprehension: how different allele combinations can lead to different physical appearances	Use slides 13 to 14 of U1_L2_ALL1 and U1_L2_ALL2 Go to slide 13 and ask them which color should the peas of the second row be like. Check with slide 14 and ask them which color should the peas of the third row (first generation) be like. Note that these are all descendants of purebred crossings. Check with slide 15 and ask them which color should the peas of the fourth row (second	**Skills** L S R W **Key vocabulary** descendant; generation; dominant; recessive **Communicative structures** I agree because... I disagree because .... I think that	☒ Whole class ☐ Group work ☐ Pair work ☒ Individual work	• U1_L2_ALL1.pptx • U1_L2_ALL2.pptx	feedback from students

			generation) be like. Note that these are hybrids of two purebreds with different phenotypes (green and yellow), yet all are yellow. Check with slide 16. Note that one of four of the descendants is green, even if the two parents where yellow: but the parents were not purebred! What happened?				

7	10	Knowledge: correlation between phenotype and genotype	Use slides 17 to 19 of U1_L2_ALL1 and U1_L2_ALL3. Watch (twice, stop at 1:37) the video of slide 18. Then give U1_L2_ALL3 as	**Skills** L S R W **Key vocabulary** homozygous; heterozygous; genotype; phenotype **Communicative structures**	☒ Whole class ☐ Group work ☒ Pair work ☐ Individual work	• U1_L2_ALL1.pptx • U1_L2_ALL3.pptx	feedback from students

			handout to all students and ask them to work in pairs to complete it: all information heard in the video is reported in the hand out. Akllw 5-10 minutes, then ask students to read what they used to fill in the table: example of sentence should be "genotype YY has only one allele, Y, and is homozygous, its phenotype is yellow".				
8	5		Final recap: 1) write on the blackboard YY and ask what it represents (a genotype), how many alleles (versions of the factor) there	**Skills** L S R W **Key vocabulary**	☒ Whole class ☐ Group work ☐ Pair work ☐ Individual work		feedback from students

			are (only one, Y) and if the individual is homo- or heterozygous (homozygous) 1) write on the blackboard Yy and ask what it represents (a genotype), how many alleles (versions of the factor) there are (Y and y) and if the individual is homo- or heterozygous (heterozygous); also, what is its phenotype? (yellow), which is the dominant allele? (Y, capital letter means dominate allele)	**Communicative structures** ... is a genotype/phenotype The individual with .... genotype is homo/heteorzygous			

CLIL Lesson Plan

Unit number	1	**Lesson number**	3	**Title**	Mendel’s principles of inheritance 2

Activity	**Timing**	**Learning Outcomes**	**Activity Procedure**	**Language**	**Interaction**	**Materials**	**Assessment**
1	10	Knowledge: concept of dominance and recessivity; difference between genotype and phenotype; how genotype and phenotype are correlated; concept of randomness	Introduction and activation, bring back knowledge from previous lessons; actually repeat the same final activity of previous lesson: 1) write on the blackboard YY and ask what it represents (a genotype), how many alleles (versions of the factor) there are (only one, Y) and if the individual is homo- or heterozygous (homozygous). Ask they know what could be a homozygous recessive genotype (yy). 1) write on the blackboard Yy and ask what it represents (a genotype), how many	**Skills** L S R W **Key vocabulary** genotype; phenotype; domaninat; recessive; allele **Communicative structures** Use structures of the questions in the slides	☑ Whole class ☐ Group work ☑ Pair work ☑ Individual work		

			genotype), how many alleles (versions of the factor) there are (Y and y) and if the individual is homo- or heterozygous (heterozygous); also, what is its phenotype? (yellow), which is the dominant allele? (Y, capital letter means dominate allele) Now use slide 1 of U1_L3_ALL1, ask students to write individually the answers to the questions down in their notebook (allow 3 minutes), then ask them to compare with their classmate and finally ask some of them to report their answers to the entire class. Always ask the class if everybody agrees or if someone disagrees.				

2	15	Knowledge: concept of dominance and recessivity; difference between genotype and phenotype; how genotype and phenotype are correlated; concept of randomness	Watch the video in slide 2 of U1_L3_ALL1 (from 1:10 to 2:23) to re-activate previous knowledge. Then distribute handout (U1_L3_ALL2) to all students (show slide 3 of U1_L3_ALL1). This handout report key concepts learned in the previous lesson and watched in the video. Ask students to work in pairs and to complete the handout. Then ask students what they have written and ask the class if everybody agrees. Finally, use slide 4 of U1_L3_ALL1 to check answers.	**Skills** L S R W **Key vocabulary** heterozygosity; homozygosity; random **Communicative structures**	☒ Whole class ☐ Group work ☒ Pair work ☐ Individual work	• U1_L3_ALL1.pptx • U1_L3_ALL2.pptx	self assessment; peer assessment
3	25	Comprehension: how alleles are passed to the next generation to form a phenotype	Distribute the handout U1_L3_ALL1 with all instructions needed by a group (3 or 4 pupils) to replicate the game. Use slides 5 and 6 of U1_L3_ALL1 to explain each step of the procedure. You should prepare in advance a	**Skills** L S R W **Key vocabulary** flip; heads and tails; **Communicative structures** see hand outs	☐ Whole class ☒ Group work ☐ Pair work ☐ Individual work	• U1_L3_ALL1.pptx • U1_L3_ALL3.pptx	The group work may be assessed using U1_L3_ALL4

			set of blue (or other colour) cards and of transparent cards. Each group should receive at least two blue and two transparent cards. The blue card is meant to represent the dominant allele, the transparent one the recessive allele: when the two cards will be superimposed (=genotype), the phenotype (colour) will always match that of the dominate allele (the blue card). The step by step procedure that each group should follow is: 1) Take a coin and decide which allele corresponds to which side of the coin (for example heads could be recessive and tails dominant). 2) Flip the coin: the card matching the side will be passed to the descendant (i.e. to the next generation) by the mother. 3) Repeat (2) to see which allele is passed by the					

			father. 4) Look at the genotype of the descendant: what is its phenotype? 5) Repeat steps (2) to (4) to obtain 12 descendants. For each, record genotype and phenotype. 6) How many different genotypes and phenotypes did you obtain? 7) Compare with the rest of the class. Students should understand that alleles are passed at random and that getting a homozygous or heterozygous individual (or a certain phenotype) is just a matter of probability.				

CLIL Lesson Plan

Unit number	1	**Lesson number**	4	**Title**	Mendel’s principles of inheritance 3

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

1	10	Knowledge: activate previous knowledge	Use U1_L4_ALL1 Show slide 1 and ask students to identify the mistakes (let them write them down in their notebook). Ask one or more volunteers to report to the class. Do all students agree? Show slide 2 and let the students compare to their answers. Answer to possible doubts or questions asked by the students.	**Skills** L S R W **Key vocabulary** **Communicative structures** I think .... is wrong because	☒ Whole class ☐ Group work ☐ Pair work ☒ Individual work	• U1_L4_ALL1.pptx	feedback from students

2	10						

		Knowledge: Law of independent assortment Comprehension: understand that each trait is under a different factor and there can be all different combinations of allele/genotypes/phenotypes	Use U1_L4_ALL1 Watch video in slide 4 (start at 2:23; watch it twice, with subtitles and speed set at 0.75). Show slide 4 and give students the handout U1_L4_ALL2. Ask them to focus on a factor at a time: for example, colour is defined by two alleles, Y and y (the two alleles of the factor controlling color), while seed shape is defined by the alleles R and r (the two alleles of the factor	**Skills** L S R W **Key vocabulary** wrinkled; assortment; independence **Communicative structures**	☒ Whole class ☐ Group work ☐ Pair work ☐ Individual work	• U1_L4_ALL1.pptx • U1_L4_ALL2.pptx	self assessment

			controlling shape). Take any question, as this is not an easy concept to grasp.				
3	25	Comprehension: learn how alleles segregate independently and how they lead to different genotypes and phenotypes	Use slides 5 to 8 of U1_L4_ALL1 and handout U1_L4_ALL3. Distribute handout U1_L4_ALL3 to students and use slide 5 of U1_L4_ALL1 to briefly explain what students should do. Students work in pairs, with teacher answering to any question that may arise.	**Skills** L S R W **Key vocabulary** **Communicative structures** Can you tell me which genotypes and phenotypes will result from this cross? Allele ... combined with allele ... produces genotype ..., which gives the ... phenotype	☒ Whole class ☒ Group work ☒ Pair work ☐ Individual work	• U1_L4_ALL1.pptx • U1_L4_ALL3.pptx	self and peer assessment

			Exercise 1) After around 10 minutes ask one student to read the text and check if text has been completed correctly using slide 6. Then ask one pair of students to come to the blackboard and write down the two 2x2 Punnet squares. Expect other students to confirm what reported on the board. Finally use slide 7 to verify its accuracy. Exercise 2) Ask one student to					

			read the text. Then ask one pair of students to come to the blackboard and write down the 4x4 Punnet squares. Expect other students to confirm what reported on the board. Finally use slide 8 to verify its accuracy. To verify if students have correctly understood the difference between genotype and phenotype use slide 9 (ask the class how					

			many genotypes and phenotypes are present in the Punnet square). Check with slide 10				
4	5		Wrap up of what done during the lesson. Ask students what is the law of independent assortment.	**Skills** L S R W **Key vocabulary** **Communicative structures**	☒ Whole class ☐ Group work ☐ Pair work ☐ Individual work		

CLIL Lesson Plan

Unit number	1	**Lesson number**	5	**Title**	Wonder Birds

Activity	**Timing**	**Learning Outcomes**	**Activity Procedure**	**Language**	**Interaction**	**Materials**	**Assessment**
1	5		Knowledge activation: in this lesson students will use their knowledge about alleles, dominance and independent assortment to make a cross simulation. Quickly revise these concepts using U1_L5_ALL1	**Skills** L **S** R W **Key vocabulary** **Communicative structures** See slides	☐ Whole class ☐ Group work ▣ Pair work ☐ Individual work	• U1_L5_ALL1.pptx	
2	40	Application: use Punnet squares to simulate the cross between two parents.	Distribute to each student the hand out U1_L5_ALL2 Students work in groups of three. First let one student read the introduction to the class. Then allow students 5 minutes to complete the table. Ask one student to read how they completed row 1, another student to read how they completed row 2, a third student to	**Skills** L **S** **R** **W** **Key vocabulary** **Communicative structures** Complete the assignment. What do you think about ...?	▣ Whole class ▣ Group work ☐ Pair work ☐ Individual work	• U1_L5_ALL2.pptx	It is possible to use the rubric U1_L3_ALL4 to asses the group work.

			read how they completed row 3. Correct answers are : - XX (BIG), Xx (BIG), and xx (small) - RR (Red), Rr (Red), and rr (White) - AA (Long beak), Aa (Long beak), and aa (Short beak) Make sure everybody agrees, because this information will be used later in the activity. The four bullet points give a brief overview about what already done and is meant to reinforce their knowledge and comprehension. Let four students read this to the class, take any question, then ask them to complete the activity: all instructions are present in the hand out, students should know how to play the "random" choice of allele by flipping the coin (see Lesson 3). Teacher should let students work independently: within each group one student could be assigned to coin flipping, a second to taking notes about the allele and hence genotype of the descendants, the third to draw the birds. During the last 10 minutes go to					

			questions 6 and 7 of the activity sheet and discuss that with the entire class. Students should directly observe that different genotypes may result iniientical phenotypes and that there could be identical phenotypes (descendants) originating from different phenotypes (parents).				
3	5	Sum up what learned during the lesson	Draw a bird (Big, Red, long beak) on the back board and ask students what could be its genotype. Choose on of the correct answers and ask which alleles should be changed to obtain a Big White short-beaked bird	**Skills** L S R W **Key vocabulary** **Communicative structures** What genotype corresponds to this phenotype? Can other genotypes lead to the same phenotype? Which alleles should be changed to obtain that phenotype?	☑ Whole class ☐ Group work ☐ Pair work ☐ Individual work		Self assessment

CLIL Lesson Plan

Unit number	2	**Lesson number**	1	**Title**	What is inheritance: mitosis

Activity	**Timing**	**Learning Outcomes**	**Activity Procedure**	**Language**	**Interaction**	**Materials**	**Assessment**
1	10	During this activity students revise previous knowledge	Distribute to all students U2_L1_ALL2 Ask students to complete the text (show slide 1 of U2_L1_ALL1) using the appropriate terms, then ask them to check their solutions with those of the desk mate. Finally use slide 2 of U2_L1_ALL1 to give correct terms. Point out that during past lessons we explained what inheritance is, yet we still have to see how it works: how is information inherited, how does it pass from one generation to another?	**Skills** L S R W **Key vocabulary** **Communicative structures**	☒ Whole class ☐ Group work ☒ Pair work ☒ Individual work	• U2_L1_ALL1.pptx • U2_L1_ALL2.pptx	

2	15	Students are introduced to the fact that information need to be passed not only from one generation to another, but also from one cell to another	Use U2_L1_ALL1 Show slide 3 and verify that students remember the fact that cells are the smaller unit of every living organism Show slide 4 and ask what students think about the statements Show slide 5 and explain that our cells keep dividing and dying (with some exceptions). Make some examples taken from the table, for example about skin cells and cells of the nervous system. Go to slide 6 and ask how is it that for example eyes are still blue or brown even if the cells that "make" the colour have died: the factor with the instruction for eye colour has passed to the new cells, but how? Take opinions and possible questions from students.	**Skills** L S R W **Key vocabulary** cell; mitosis; cell division; chromosome **Communicative structures** Do you remember ...?	☒ Whole class ☐ Group work ☐ Pair work ☐ Individual work	• U2_L1_ALL1.pptx	feedback from students
3	20	Students learn the steps of cells division (mitosis) and realise that	Show slide 7 of U2_L1_ALL1 and the very fact that we are made of millions of cells means and that at the beginning	**Skills** L S R W	☒ Whole class ☐ Group work ☐ Pair work	• U2_L1_ALL1.pptx • U2_L1_ALL3.pptx	self and peer assessment

		chromosomes are duplicated at every cell division cycle.	"we" were just a single cell means that our cells have divided multiple times: this process is called mitosis. Give hand out U2_L1_ALL3 (each sheet has two cell sets) to all students. Explain that they have to cut (using scissors) the five figures containing the cell/s. Tell them that they have re-order the five figures to start from a single cell (a) and get to two identical cells (e). Ask them to work individually and then comare their results with those of there desk mate. Then show slide 8 and verify with them that the order is the correct one. Go to slide 9 and explain that the two chromes (the red and the blue ones) are just two copies of the same chromosome: ask students if this does remind them about another occasion in which we have encountered two copies of something. Answer is in slide 10: the two	**Key vocabulary** replication; terminology from the inheritance unit **Communicative structures**	▣ Individual work			

			chromosomes come from the two parents, as the two copies (alleles) of each factor controlling our traits (phenotype) come from our parents! Factors, that is information, is found in chromosomes (which are made of DNA, but more about this later)				
4	4	Sum up of the lesson	Taking questions and clearing doubts.	**Skills** L S R W **Key vocabulary** **Communicative structures** Any question? Have you all understood?	☒ Whole class ☐ Group work ☐ Pair work ☐ Individual work	feedback from students	

CLIL Lesson Plan

Unit number	2	**Lesson number**	2	**Title**	What is inheritance: meiosis

Activity	**Timing**	**Learning Outcomes**	**Activity Procedure**	**Language**	**Interaction**	**Materials**	**Assessment**
1	5	During this activity students revise previous knowledge	Use U2_L2_ALL1 Show slide 1 and ask students to describe mitosis. Then switch to slide 2 point to the fact that the chromosome are inherited from both mother and father, so at a certain point cells should have only one set of chromosomes...	**Skills** L S R W **Key vocabulary** **Communicative structures**	☑ Whole class ☐ Group work ☐ Pair work ☐ Individual work	• U2_L2_ALL1.pptx	
2	20	Students learn the process of meiosis	Use U2_L2_ALL1 Go to slide 3 and ask the three questions to the students: allow them 1 minute to think about the possible answers, then take them from volunteers or from specific pupils. (we inherited 23 chromosomes from each of our parents).	**Skills** L S R W **Key vocabulary** meiosis; parental cell; daughter cells; recombination	☑ Whole class ☐ Group work ☑ Pair work ☑ Individual work	• U2_L2_ALL1.pptx • U2_L2_ALL2.pptx	self and peer assessment; feedback from students

			Go to slide 4 and distribute U2_L2_ALL2 hand out. Explain that they have to cut (using scissors) the six figures containing the cell/s. Tell them that they have re-order the six figures, so that from a single cell (a) we get four identical cells (f). Ask them to work individually and then compare their results with those of there desk mate. Then show slide 5 and verify with them that the order is the correct one. Ask: What is different from mitosis? (answer: daughter cells have only one copy of each chromosome) Point out that in this figure chromosomes with the same size represent two copies (coloured one in grey and the other in red) of the same chromosome (the two copies coming from the two parents). Ask students if they notice something particular when comparing the chromosomes of the parental and of the daughter cells (hint: colours). Go to slide 6 and	**Communicative structures** What is different from mitosis? What happened to the chromomsomes? Do you notice something particular?				

			explain what happened: during recombination, pieces of DNA (of the chromosomes) are broken and recombined to produce new combinations of alleles. Explain that this is the reason why, although chromosomes always contain the same factors, they contain different alleles and why there is independent assortment. Each factor (allele) is passed independently to the descendants.				

3	20	Students use the information learned in this lesson and in the previous unit, and comprehend how inheritance, mitosis and meiosis are related one to the other.	Distribute hand out U2_L2_ALL3 to all students and ask them to complete it as individual work. Allow 10 minutes, then ask students (in turn) to read the sentences. Ask the class if they agree to the term chosen by the student. At the end show slide 7 of U2_L2_ALL1 to allow everybody to check her/his text. Show slide 8: explain that we inherit half of the chromosomes from our mother and half from our mother thanks to meiosis.	**Skills** L S R W **Key vocabulary** **Communicative structures** Complete the text	☒ Whole class ☐ Group work ☐ Pair work ☒ Individual work	• U2_L2_ALL3.pptx	self assessment
4	5	sum up	Ask students what is the difference between mitosis and meiosis. Check if the key concepts have been understood.	**Skills** L S R W **Key vocabulary** **Communicative structures**	☒ Whole class ☐ Group work ☐ Pair work ☐ Individual work		feedback from students

CLIL Lesson Plan

Unit number	2	**Lesson number**	3	**Title**	What do we inherit?

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

1	30	introduction, activation	During this activity students will write down questions about inheritance (Mendel's rules, heredity mechanisms) that they will then ask their class mates. Students work in groups of 3/4 and prepare 4 questions on the topics done so far. Allow them 10 minutes to prepare questions, which should then be passed to another group (for example that at their left or front). Ask students to write answers down on a sheet of paper and then return them to the group that has prepared them (10 minutes). The latter should correct those answers (5 minutes). Finally groups will explain/clarify/compare questions and answers with their partner group (5 minutes).	**Skills** L S R W **Key vocabulary** **Communicative structures** Students should use questions such as: What is a recessive/dominate allele? What is a genotype? What is mitosis? Complete the following Punnet square…	☐ Whole class ☒ Group work ☐ Pair work ☐ Individual work		self and peer assessment; feedback from students

2	15	Students learn how DNA, by being passed from generation to generation, constitutes the hereditary material that is shared among family members	Use U2_L3_ALL1 Distribute to all students U2_L3_ALL2 and then watch video in slide 1 of U2_L3_ALL1 (watch it twice, with subtitles). Let students compare their text with the desk mate, then show slide 2 of U2_L3_ALL1 to make sure everyone has a corrected version of the text.	**Skills** L S **R** **W** **Key vocabulary** **Communicative structures**	☐ Whole class ☐ Group work ☒ Pair work ☒ Individual work	• U2_L3_ALL1.pptx • U2_L3_ALL2.pptx	self and peer assessment
3	5	Sum up	Ask students if they have any question.	**Skills** **L** **S** R W **Key vocabulary** **Communicative structures**	☒ Whole class ☐ Group work ☐ Pair work ☐ Individual work		self assessment

CLIL Lesson Plan

Unit number	2	**Lesson number**	4	**Title**	Intermediate assessment: Mendel and heredity

Activity	**Timing**	**Learning Outcomes**	**Activity Procedure**	**Language**	**Interaction**	**Materials**	**Assessment**
1	30	Intermediate test	This is an intermediate summative test to be done as group work. You should prepare the materials beforehand: print several copies of page 1 of the hand out U2_U4_ALL2 and cut away all cells. For each sheet you obtain three decks of 10 cards each: 1) Definitions; 2) Terms; and 3) Examples. The test is divided in two phases: a first during which students work independently, and a second in which students work in groups of three. Groups should be decided beforehand, such that, during phase 1, the three students will get decks 1&2, 2&3 and 1&3 respectively (see below). Allow 5 minutes to	**Skills** L S **R** **W** **Key vocabulary** see all terms of the previous lessons **Communicative structures**	☐ Whole class ☑ Group work ☐ Pair work ☑ Individual work	• U2_L4_ALL2.pptx	self and peer assessment

			Allow 5 minutes to organize the test and give brief explanations. Start with phase 1 (15 minutes): distribute to each student 2 decks and an empty sheet (page 2 of U2_U4_ALL2; ask them to write their name on the back of the sheet). Students must match cards from the two decks (Term to Example, Definition to Example, Definition to Term; of course, the type of match depends on the card decks the student has) and glue them in a row in the sheet, under the appropriate column. During phase 2 (10 minutes) the three students work in group: they receive all three decks and an empty sheet (page 2 of U2_U4_ALL2; ask them to write their name on the back of the sheet) and they have to complete the entire table by combining the matches already produced independently. Of course there is the chance that one or more students have mis-matched some					

			of the cards, and the group members must identify the mistake and correct it.				
2	20	Correction	The correction is made using U2_U4_ALL1. Go through the slides and ask students to suggest their matches before showing the solutions. Students should correct their matching sheet (both the one produce individually and the one completed in group). They must take note of the number of mistakes they made: at the end of the correction, they can grade themselves: start from a mark of 10, decrease by 0.5 points for every mistake.	**Skills** L S R W **Key vocabulary** **Communicative structures**	☐ Whole class ▣ Group work ☐ Pair work ▣ Individual work	• U2_L4_ALL1.pptx	self and peer assessment

CLIL Lesson Plan

Unit number	3	**Lesson number**	1	**Title**	What are DNA and genes?

Activity	**Timing**	**Learning Outcomes**	**Activity Procedure**	**Language**	**Interaction**	**Materials**	**Assessment**
1	5	Activation: what is DNA?	Ask students what do they know about DNA. Write on the black board words, sentences, drawings, that students suggest. First let them think about what they do know about the topic, then ask for feedback. Refer to this "map" when discussing the rest of the lesson	**Skills** L S R W **Key vocabulary** DNA **Communicative structures**	☑ Whole class ☐ Group work ☐ Pair work ☐ Individual work		feedback from students
2	15	Knowledge: what is DNA and what are genes. Comprehension: understand how DNA sequences contain the information	During this activity students are introduced to DNA, genes and genome. This activity constitutes the backbone for this Unit. It is important that	**Skills** L S R W	☐ Whole class ☐ Group work ☐ Pair work ☑ Individual work	• U3_L1_ALL1.pptx • U3_L1_ALL2.pptx	self and peer assessment

		used to make an organism	students get familiar with the terminology and some concepts that will be reinforced during the next lessons. Distribute to students the hand out U3_L1_ALL2, which contains text to be completed while watching a video (see below). Use slide 1 of U3_L1_ALL1 presentation: watch video twice, first with, then without subtitles. Then ask students to read though the text and finally have them check their version using slide 2 of U3_L1_ALL1. Provide the students with translations of the terms they do not understand (write them on the board; students need to write them down in their word bank).	**Key vocabulary** DNA; genes; genomes; sequence; information; instruction; nucleotide; base **Communicative structures**			

3	30	Knowledge: the DNA molecule	Distribute to students the handout U3_L1_ALL3, which contains instructions and materials to make a paper model of a DNA molecule. By building the model students will understand that the molecule is made by only 4 bases organized in pairs, where A always matches with T and C with G. These bases are the "letters" used to write instructions in the DNA. Let some students read to the class the instructions and clarify possible doubts. Then let students work in pairs, being always available for questions and suggestions. This activity may also be completed at home.	**Skills** L S **R** W **Key vocabulary** helix; structure; molecule; bonds; A = adenine; C = cytosine; G = guanine; T = thymine **Communicative structures** see handout	☐ Whole class ☐ Group work ▣ Pair work ▣ Individual work	• U3_L1_ALL3.pptx	self and peer assessment

CLIL Lesson Plan

Unit number	3	**Lesson number**	2	**Title**	Where is my DNA?

Activity	**Timing**	**Learning Outcomes**	**Activity Procedure**	**Language**	**Interaction**	**Materials**	**Assessment**
1	5	Activation: what is DNA?	Students briefly describe the DNA paper model (see U3_L1). Revise key words by writing them on the board	**Skills** L S R W **Key vocabulary** **Communicative structures**	☒ Whole class ☐ Group work ☐ Pair work ☐ Individual work	• U3_L1_ALL3.pptx	feedback from students

2	20	Knowledge: DNA structure, from nucleotides to genome; Comprehension: how information is coded into the DNA	Distribute to students the two hand outs U3_L2_ALL1 and U3_L2_ALL2. Ask students to first read by themselves U3_L2_ALL1, then ask some of them to read the text to the class and answer to possible questions. Finally ask students to work in pairs and complete the text of U3_L2_ALL2. Most of the information needed to complete this task is found in U3_L2_ALL1, but the final questions refer to topics encountered in the previous units and serve as reminders and help students to make connections between them. Then ask students to read though the text and finally have them check their version using U3_L2_ALL3.	**Skills** L S R W **Key vocabulary** cromatids; histone; base pair; complementary; proteins; chromosome; strand; polymerase; **Communicative structures**	☐ Whole class ☐ Group work ▣ Pair work ☐ Individual work	• U3_L2_ALL1.pptx • U3_L2_ALL2.pptx • U3_L2_ALL3.pptx	self assessment; feedback from students

3	25	Application: students use what learned so far and new information to prepare questions for their peers.	Distribute the hand out U3_L2_ALL4. This hand out contains fun facts about DNA. Split the class into two groups: each group should read through the text and prepare 4 questions to be answered by the other group. Suggest students to form sub-groups preparing questions on specific points of the hand out, which could then be evaluated by the whole group to finally decide the four final questions. This phase should take about 15 minutes. Then each group should ask the question and allow 1 minute to get the answer. If this answer is incorrect, the group should provide the correct one.	**Skills** L S R W **Key vocabulary** as in activity 2; also see hand out **Communicative structures**	☒ Whole class ☒ Group work ☐ Pair work ☐ Individual work	• U3_L2_ALL4.pptx	self and peer assessment

CLIL Lesson Plan

Unit number	3	**Lesson number**	3	**Title**	Lab experience: DNA extraction

Activity	**Timing**	**Learning Outcomes**	**Activity Procedure**	**Language**	**Interaction**	**Materials**	**Assessment**
1	5	Activation: what is DNA?	Tell students to name three things that they eat or drink and that do not contain DNA (e.g. coke, sugar, oil, flour) and three things that do contain DNA (everything of animal or vegetal origin that contains cells, including meat and fruit). Remind them that all organisms are constituted by one or more cells, and that DNA is contained in almost every cell, so we eat a lot of DNA.	**Skills** L S R W **Key vocabulary** **Communicative structures**	☒ Whole class ☐ Group work ☐ Pair work ☐ Individual work		feedback from students

2	15	Knowledge: learn about name of materials and methods involved in DNA extraction	This activity takes place in a laboratory. It is assumed that students are already familiar with lab etiquette and security issues. Students work in groups of 3/4, let them decide who is responsible for the correctness of the extraction procedure, who actually performs the extraction (but students may decide to work in turns), and who takes notes. Distribute to students hand outs U3_L3_ALL1 and U3_L3_ALL2 and ask them to complete the text. Then ask students to read though the text and finally have them check their version using U3_L3_ALL3. Make sure every body has the correct text, as this is also the protocol that will be used to extract DNA from bananas. The teacher must refer to some suggestions contained in U3_L2_ALL4.	**Skills** L S **R** **W** **Key vocabulary** mortar; pestle; beaker; funnel; rod; strainer; spoon; graduated cylinder; to measure; to crush; to add; to separate; to break down; to incubate; to filter; to stir; to transfer; to mix; to put **Communicative structures** see hand out	☐ Whole class ☒ Group work ☐ Pair work ☐ Individual work	• U3_L2_ALL4.pptx • U3_L3_ALL1.pptx • U3_L3_ALL2.pptx • U3_L3_ALL3.pptx	self assessment; feedback from students

3	70	Application: DNA extraction	Students, with the help of teacher and lab technician, perform DNA extraction from bananas. At the end of the extraction students may want to take pictures that can be used to prepare a lab report (see activity 4).	**Skills** L S R W **Key vocabulary** **Communicative structures**	☐ Whole class ☒ Group work ☐ Pair work ☐ Individual work	• U3_L3_ALL2.pptx	self assessment
4	10	Sum up	Ask students to tell something about their experience and discuss. Students should prepare a report where they explain what they did: short introduction (we extracted ….), materials, procedure. Students should use U3_L3_ALL2 as guidance text, whereby they take the imperative, protocol style sentences, and turn them into past tense first-person plural sentences (e.g. "Crush the bananas using the mortar ..." to "We crushed the bananas using the mortar ...").	**Skills** L S R W **Key vocabulary** **Communicative structures** see hand out U3_L3_ALL2	☒ Whole class ☐ Group work ☐ Pair work ☒ Individual work	• U3_L3_ALL2.pptx	the lab report can be assessed by the teacher; check if It contains all steps of the extraction procedure

CLIL Lesson Plan

Unit number	3	**Lesson number**	4	**Title**	About genes and proteins

Activity	**Timing**	**Learning Outcomes**	**Activity Procedure**	**Language**	**Interaction**	**Materials**	**Assessment**
1	5	Activation: what is a gene?	Students write down in a piece of paper, and later report to the class, a thought about genes: what are they? What are they used for? Why do they exist? Write everything down in the blackboard	**Skills** L S R W **Key vocabulary** **Communicative structures** What are genes? What are they used for? Why do they exist?	☑ Whole class ☐ Group work ☐ Pair work ☑ Individual work		feedback from students

2	20	Students will understand what a gene is.	Distribute to students the hand out U3_L4_ALL2 and ask them to complete the text using the information contained in the video whose link is provided in slide 1 of U3_L4_ALL1 (watch it twice, with subtitles). Then ask students to read though the text and finally have them check their version using slide 2 of U3_L4_ALL1. Next, move to slide 3 of U3_L4_ALL1, which gives a summary of what seen and introduces the next activity.	**Skills** L S R W **Key vocabulary** genetic code; shape; determine; keratin; hemoglobin; pepsin; genes code for proteins **Communicative structures** see handout	☐ Whole class ☐ Group work ☐ Pair work ▣ Individual work	• U3_L4_ALL1.pptx • U3_L4_ALL2.pptx	self assessment; feedback from students
3	20	Students will understand what a protein is.	Distribute to students the hand out U3_L4_ALL3 and ask them to complete the text using the information contained in the video whose link is provided in slide 4 of U3_L4_ALL1 (watch it twice, with subtitles). Then ask students to read though the text and finally have them check their version using slide 5 of U3_L4_ALL1.	**Skills** L S R W **Key vocabulary** amino acid; chain; building block; to carry out; body; the bulk of; nearly; chain; building blocks; broad; **Communicative structures**	☐ Whole class ☐ Group work ☐ Pair work ▣ Individual work	• U3_L4_ALL1.pptx • U3_L4_ALL3.pptx	self assessment; feedback from students

4	5	Sum up	Ask students the following questions: 1) Where are the instructions necessary to make an organism? (DNA, genes) 2) Genes are sequences of … (DNA) 3) Genes code for … (proteins) 4) Proteins are made of … (amino acids)	**Skills** L S R W **Key vocabulary** **Communicative structures** 1) Where are the instructions necessary to make an organism? (DNA, genes) 2) Genes are sequences of … (DNA) 3) Genes code for … (proteins) 4) Proteins are made of … (amino acids)	☒ Whole class ☐ Group work ☐ Pair work ☐ Individual work		self assessment; feedback from students

CLIL Lesson Plan

Unit number	3	**Lesson number**	5	**Title**	The language of genes: grammar

Activity	**Timing**	**Learning Outcomes**	**Activity Procedure**	**Language**	**Interaction**	**Materials**	**Assessment**
1	5	Activation: what is a gene?	What is a gene? Verify that students remember that it is a sequence of DNA containing the information to make a protein	**Skills** L **S** R W **Key vocabulary** **Communicative structures**	☒ Whole class ☐ Group work ☐ Pair work ☐ Individual work		feedback from students
2	40	What are proteins and how is the information contained in genes translated into proteins?	Use presentation U3_L5_ALL1. In these slides we explain how the information contained in a DNA sequence, which is written using only 4 letters, get translated in proteins that can contain up to 20 different amino acids. Every time a slide contains a question (e.g. slides 3 and 7) try to get an answer from	**Skills** **L** S R **W** **Key vocabulary** combination; translate; to enconde; U=uracil	☒ Whole class ☐ Group work ☐ Pair work ☐ Individual work	• U3_L5_ALL1.pptx • U3_L5_ALL2.pptx	self assessment; feedback from students

			the students. At slide 9 ask students to write one sentence using the words on the right side of the slide: students may come up with different sentences, just as using a set of amino acids a cell can make different proteins, depending on which amino acids (words) are used and in which order they are put. However, as shown in slide 10, some sentences do not make sense: it is the same thing with proteins, they are not a random chain of amino acids. Slides 13 to 16 illustrate the solution that organisms have found to translate DNA information into proteins: they obviously cannot associate a nucleotide to an amino acid (because there are 4 nucleotides vs. 20 amino acids), nor "words" made by 2 nucleotides (there are 4x4=16 combinations). It is necessary to use 3-letter long words (64 possible combinations), and there is a very strict rule that associates each word (a nucleotide triplet) to an amino acid: this is the	**Communicative structures** Can you answer to this question? See questions in the presentation				

			genetic code (slide 17). Give to students the hand out U3_L5_ALL2, with the genetic code. Say that it will be used in the next lesson, but that they may want to have a look at it at home. Make clear that: 1) the letter Uracil U = T, the reason for this will be explained in the next lesson. 2) most importantly: the genetic code is one and only, all organisms (all of us) have (use) the same genetic code! They have different genomes, their DNA sequence is different, but the language to translate the information contained in the DNA is the same.				

3	5	Sum up	What is a protein? Students provide simple answers and ask possible questions	**Skills** L S R W **Key vocabulary** **Communicative structures**	☒ Whole class ☐ Group work ☐ Pair work ☐ Individual work		self assessment; feedback from students

CLIL Lesson Plan

Unit number	3	**Lesson number**	6	**Title**	The language of genes: syntax

Activity	**Timing**	**Learning Outcomes**	**Activity Procedure**	**Language**	**Interaction**	**Materials**	**Assessment**
1	5	Activation: what is a protein?	What is a protein? Verify that students remember that it is a sequence of amino acids coded by DNA. Show slide 1 of U3_L6_ALL1. Mention that different DNA = different genes = different proteins = different functions = different organisms.	**Skills** L S R W **Key vocabulary** **Communicative structures**	☒ Whole class ☐ Group work ☐ Pair work ☐ Individual work		feedback from students

2	10	How is DNA translated into a protein?	Ask students to have at hand the genetic code table they received in the previous lesson (U3_L5_ALL2). Show slides 2 and 3 of U3_L6_ALL1: Introduce protein synthesis, the process that allows cells to make proteins using the information found in genes (DNA). Proceed in the presentation until slide 9: it should be now clear to students that nucleotides (letters) found in genes can be red as 3-letter words and translated, using the genetic code, to amino acids. Have them use the genetic code to check whether the translation was done correctly (for instance check that AUG corresponds to methionine - Met).	**Skills** L S **R** W **Key vocabulary** protein synthesis; codon; to transcribe (transcription); RNA; to match **Communicative structures**	☒ Whole class ☐ Group work ☐ Pair work ☒ Individual work	• U3_L5_ALL2.pptx • U3_L6_ALL1.pptx	self assessment

3	35	Apply the knowledge: translate a gene!	During this activity students will have the chance to translate a sequence of DNA to a protein. Give students hand outs U3_L6_ALL2 and U3_L6_ALL3 (3 copies per student of the latter, to be sure they have enough amino acids to build their proteins). Show slides 10, 11 and 12 of U3_L6_ALL1 to briefly explain what they have to do (note that hand outs contain instructions). Exercises 1 and 2 can be made in class, while nb. 3 can be completed at home as homework. Students can work in pairs: first they complete exercises 1 and 2 independently, then they compare with their desk mate. Be always available to clarify and help students. When students are done, go through slides 13 to 19 to check if students have made mistakes: as usual, ask students to read their answers and then show the corresponding slide.	**Skills** L S R W **Key vocabulary** **Communicative structures**	☐ Whole class ☐ Group work ☒ Pair work ☐ Individual work	• U3_L6_ALL1.pptx • U3_L6_ALL2.pptx • U3_L6_ALL3.pptx	self and peer assessment

4	5	Sum up	Ask students what is a codon and what can happen if one nucleotide (one letter) is different: does the translated amino acid change or not (answer: it depends, look at the genetic code, sometimes different codons code for the same amino acid!). This is also to introduce the next lesson.	**Skills** L S R W **Key vocabulary** **Communicative structures**	☒ Whole class ☐ Group work ☐ Pair work ☐ Individual work		feedback from students

CLIL Lesson Plan

Unit number	3	**Lesson number**	7	**Title**	Let's translate!

Activity	**Timing**	**Learning Outcomes**	**Activity Procedure**	**Language**	**Interaction**	**Materials**	**Assessment**
1	5	Activation: what is a mutation?	Ask students what they think about when they hear the word "mutation". Write on the black board their thoughts.	**Skills** L S R W **Key vocabulary** **Communicative structures**	☑ Whole class ☐ Group work ☐ Pair work ☐ Individual work		feedback from students

2	10	How does a mutation change the information?	Use slides 1 to 6 of U3_L7_ALL1. Start by making an example where a sentence is used as a proxy of a DNA sequence. Show how, by erasing one letter or changing one letter, the sentences either makes no sense or changes its meaning. This part helps the students get familiar with the notion of "mutation" as a change in the original sentence or, in the case of a gene, with its original instruction.	**Skills** L S R W **Key vocabulary** **Communicative structures**	☒ Whole class ☐ Group work ☐ Pair work ☐ Individual work	• U3_L7_ALL1.pptx	
3	5	Mutation in genotype and change in phenotype	Use slides 7, 8 and 9 of U3_L7_ALL1. Introduce the notion that a change in a DNA sequence can lead to a change in the phenotype: make connections to what done in the previous lessons (DNA duplication, genotype and phenotype).	**Skills** L S R W **Key vocabulary** **Communicative structures**	☒ Whole class ☐ Group work ☐ Pair work ☐ Individual work	• U3_L7_ALL1.pptx	
4	20	Learn what mutations are and how they happen	Use slides 10 to 22 of U3_L7_ALL1. Ask students to copy as fast as they can the DNA sequence of slide 10. Time how much it takes for the students (on	**Skills** L S R W	☒ Whole class ☐ Group work ☐ Pair work	• U3_L7_ALL1.pptx	self assessment

			average) to copy the text. Then show slide 11: briefly explain that every time cells need to duplicate the DNA they use a protein called DNA polymerase to copy the sequence of the genome. In fact (slide 12), students have copied part of the sequence of the gene coding for the hemoglobin protein (subunit B). How many mistakes have students made? Read aloud the sequence (slide 13) and ask students to count how many times they missed a letter or wrote the wrong letter. Then sum them up for the entire class. The idea is that all students (AS) combined together just copied a total of ASx90 nucleotides. Go to slide 14 and substitute the numbers in orange with the actual number of students in the class and the total number of mistakes. Also estimate the error rate accordingly (you may want to reason about how such rate is estimated together with the students). Similarly, go	**Key vocabulary** protein-coding sequence; to split; meaning; point mutation; mistake; (error) rate; **Communicative structures**	▣ Individual work			

			to slide 15 and calculate the total amount of time taken to copy the sequence. Now switch to a real case and take the human genome as example: ask students to guess how long it would take for them to copy the entire sequence and how long it takes for a cell (slides 15 to 18). Move to slides 19 to 22 to estimate the total number of mistakes that students would have made had they copied the entire human genome. Compare with what really happens in a cell and invite them to appreciate how much more accurate and fast cells are to their job! Finally use slides 23 and 24 to explain how a mutation in the DNA sequence can affect the phenotype (in this case the efficiency of oxygen transport: a mutation could make someone better or worse in doing sports, for example, by modifying the affinity for oxygen and thus the efficiency of delivering					

			oxygen to the muscles).				
5	10	Sum up activity	Distribute to students hand out U3_L7_ALL2 and briefly explain them what they have to do (slides 25 and 26; the hand out contains instructions). Ask some of the students who made mistakes in copying the sequence (see previous activity) what kind of mistake they made: choose 2 or three of the mistakes (discard missing/additional letters; mistakes should be, for example, A instead of T, or C instead of A). Map them into the sequence of the handout and let the students complete the assignments. Students can work in pairs. Be always available to clarify and help students. When students are done, use slide 25 to check if students have made mistakes.	**Skills** L S R W **Key vocabulary** **Communicative structures**	☒ Whole class ☐ Group work ☒ Pair work ☐ Individual work	• U3_L7_ALL1.pptx • U3_L7_ALL2.pptx	self and peer assessment

CLIL Lesson Plan

Unit number	3	**Lesson number**	8	**Title**	Assessment: DNA and genetics

Activity	**Timing**	**Learning Outcomes**	**Activity Procedure**	**Language**	**Interaction**	**Materials**	**Assessment**
1	50	Summative test	During this lesson, students take a summative test about DNA and proteins. U3_L8_ALL1 is the main test, while U3_L8_ALL3 is intended for students with cognitive disabilities. U3_L8_ALL2 and U3_L8_ALL4 contain the solutions and can be used to check the single tests. Teacher should be available for clarifications: ask students to read through the test during the first 5 minutes, and then take any question they may have.	**Skills** L S **R** **W** **Key vocabulary** **Communicative structures**	☐ Whole class ☐ Group work ☐ Pair work ☒ Individual work	• U3_L8_ALL1.pptx • U3_L8_ALL2.pptx • U3_L8_ALL3.pptx • U3_L8_ALL4.pptx	teacher assessment of the test: U3_L8_ALL2 and U3_L8_ALL4 contain the solutions and can be used to check the single tests.

CLIL Lesson Plan

Unit number	4	**Lesson number**	1	**Title**	Bacteria evolution

Activity	**Timing**	**Learning Outcomes**	**Activity Procedure**	**Language**	**Interaction**	**Materials**	**Assessment**
1	10	Activation: are mutations common? Are they "dangerous" or "useful"?	In this Unit some examples of the consequences of mutations will be provided. Introduce the subject by asking what students think about mutations: are they something to worry about? Are they something dangerous? The common notion is that yes, mutation=something bad, however mutations is what makes us different, so they can also be beneficial. Write on the black board what are the thoughts at this regard.	**Skills** L S R W **Key vocabulary** **Communicative structures**	☑ Whole class ☐ Group work ☐ Pair work ☐ Individual work		feedback from students
2	20	Mutations and bacteria: how changing	Use U4_L1_ALL1. Show slide 1 and ask students what they see, then move to slide 2 and 3: the	**Skills** L S R W	☑ Whole class ☐ Group work	• U4_L1_ALL1.pptx	self assessment; feedback from students

		DNA can make you better.	pictures show bacteria colonies growing on a medium on which a hand and a cell phone have been placed onto. Both the cell phone and the hand were "dirty", that is, they had lots of bacteria on them, which can now freely grow over the plate. Show an example of bacteria colonies growing in slide 4 (short video). Show ho bacteria divide in slide 5 (short video): ask students what they do see. Bacteria divide, hence what do they need to do? Answer: duplicate their DNA. Are the two DNA copies identical? No, the copied DNA can contain mutations. Show slide 6 and 7: bacteria can double their number at every generation. Some bacteria are fact at dividing, some are slower. Students are now guided through an example of a bacteria colony growing in a plate, just like in the video. Show slides 8 to 14 and see if they can identify the mathematical rule that describes the relationship	**Key vocabulary** bacteria; generation; cell division; fission; generation; generation time; colony; rule; to halve; to double **Communicative structures**	☐ Pair work ☐ Individual work		

			between number of bacteria and generation. Go to slide 15 and make sure they realize how fast a colony can grow, i.e. how many bacteria there can be starting from a single cell. Ask students what they expect if there are two bacteria with different generation times and show slides 16 to 20: colonies formed by bacteria with shorter generation time get bigger much faster! Show slide 21 to have an example. Ask students if the think whether is better to have slow or fast generation time and discuss briefly their answers.				
3	15	Mutations and bacteria: apply your knowledge to simulate bacteria populations	Give to students the hand out U4_L1_ALL2 and explain briefly the activity using slide 22 of U4_L1_ALL1. Students will use their knowledge about generation time and bacteria to simulate the population dynamics of two bacteria colonies with different genotypes. The three simulations mimic examples in which the two	**Skills** L S **R** **W** **Key vocabulary** **Communicative structures**	☐ Whole class ☐ Group work ▣ Pair work ▣ Individual work	• U4_L1_ALL1.pptx • U4_L1_ALL2.pptx	self and peer assessment

			parental bacteria (the "white" and the "black" ones) have identical genotypes or in which one of the bacteria has experienced a mutation that changed its genotype: the mutation is in the gene that codes for a protein involved in cell division. Students will understand that if the mutation shortens generation time it will increase the speed at which the colony doubles, thus making the carrier more efficient and thus better in a competition towards the other bacteria. When students are done with their exercises, let them compare their results with their desk mate and then use slides 23, 24 and 25 to verify the results.				

4	5	Sum up	Ask students if they think mutations are always bad: based on the last activity they should have seen that sometimes they can be advantageous (see next lesson).	**Skills** L S R W **Key vocabulary** **Communicative structures**	☒ Whole class ☐ Group work ☐ Pair work ☐ Individual work		feedback from students

CLIL Lesson Plan

Unit number	4	**Lesson number**	2	**Title**	What is evolution? An abstract

Activity	**Timing**	**Learning Outcomes**	**Activity Procedure**	**Language**	**Interaction**	**Materials**	**Assessment**
1	5	Activation: on the importance of mutations in evolution	Students are asked the following questions: Can mutations be useful and be passed to the next generations? Or do mutations always "stop" there because the carrier dies out?	**Skills** L **S** R W **Key vocabulary** **Communicative structures**	☒ Whole class ☐ Group work ☐ Pair work ☐ Individual work		feedback from students
2	15	Students understand why mutations can be beneficial	Use U4_L2_ALL1. Start with slide 1 and ask if they think that evolution is what depicted in the slide. Let them brainstorm together and then say that this is a wrong way to represent evolution (slide 2). Do not explain why exactly, just tell them	**Skills** **L S R W** **Key vocabulary** evolution; change; antibiotic; resistance; novel mutation; concentration	☒ Whole class ☐ Group work ☐ Pair work ☒ Individual work	• U4_L2_ALL1.pptx • U4_L2_ALL2.pptx	self assessment

			that the picture let us think that evolution=progress with an aim, whereas evolution is just a change over time, non need to have an aim. Tell them that during the lesson we will see why. Give to students hand out U4_L2_ALL2 (slide 3), and ask them to complete it after having seen a video (slide 4; use subtitles). Before watching the video explain that: what they will see is a very big plate as the one they have seen and simulated during the past lesson. Bacteria colonies begin to grow at the left and right hand sides of the plate (bacteria colonies appear as white). Scientists have added anti-bioticsat different concentrations in the plate, at increasing concentrations towards the center. Ask students if the know what an antibiotic is. Exaplain that	**Communicative structures**			

			antibiotics kill or prevent bacteria to reproduce. Watch the video, stop whenever you see bacteria stopping their growth and then "branching out" (i.e. expanding the population): ask students if they have an idea why that happened: why the expansion suddenly stopped and why, after a certain time, the begin expanding again? (when a mutation make them resistant to that concentration of antibiotics, all descandants from that mutated bacteria will be able to survive and thus will multiply). What is thecoloured tree-like drawing shown at the end? It shows ancestors (parents) and their descendants: the latter have inherited the genotype from their parents, so they have inherited the mutated genes, the bacteria				

			have evolved and there are more evolutionary lines (sub-populations) originated from a single population. At the end of the video let students fill in the activity sheet and then discuss with them about antibiotic resistance. When we take antibiotics, something similar to				

3	25	Knowledge and comprehension: basics of evolution	Use slide 6 of U4_L2_ALL1: ask students if the picture reminds them of something seen in te video just watched. The tree-like scheme is like the one seen for bacteria: starting from a single ancestor, multiple species have evolved and they are diferent because there have been mutations and because some of them were passed to the next generations. Watch the video in slide 7 (with subtitles). Give to students hand out U4_L2_ALL3 and once completed let them check their answers with their desk mate and then use slide 8 to do a class correction.	**Skills** L S R W **Key vocabulary** **Communicative structures**	▣ Whole class ☐ Group work ▣ Pair work ▣ Individual work	• U4_L2_ALL1.pptx • U4_L2_ALL3.pptx	self and peer assessment

4	5	Sum up	Ask students if they think that humans and other animals are still evolving. Answer is yes, because mutations will always happen, because there will (hopefully) be always new generations and because if the enviroment changes there will always be the chance to have "better" geneotypes and phenotypes.	**Skills** L S R W **Key vocabulary** **Communicative structures**	☒ Whole class ☐ Group work ☐ Pair work ☐ Individual work		self assessment; feedback from students