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Topic: Human Heart (anatomy & physiology)
Content Objective: Curriculum of *Liceo Scientifico* | Age: 16-year-olds | Language Level of learners: B1

24 CLIL-based learning activities | 120-150 min learning time

BOX-1. GAUGE:**
Questions students can answer at the conclusion of Lesson 1 (of 2):

- At what moment does blood from the **right ventricle** mix with that in the **left ventricle**?
- Why is blood passing through the **tricuspid valve** darker than that passing through the **mitral (bicuspid) valve**?
- Where is the pressure higher, in the **superior vena cava** or in the **aorta**? Why?
- Which chamber provides the pressure to pump blood from the foot to the heart?

Extra credit:

- Untreated **strep throat** which progresses to **rheumatic fever** can damage the aortic and mitral valves, causing *heart valve disease*: how would this affect blood flow and why would the common symptoms be **unusual fatigue**, **shortness of breath** and **swelling** in feet and legs?

**Here we present only three of the 24 CLIL tasks, which can be completed in about 120-150 minutes of learning time. Since CLIL "starts slowly" the first few CLIL tasks seem simple, so science teachers often wonder if the process is too simplistic: do we simplify the content? Absolutely not.

- These questions in BOX-1show science teachers the types of questions students can very easily answer at the end of the set of 24 CLIL-tasks.
- It should be noted that, after completing the CLIL materials in class, students are *expected to* then refer to their textbooks during self-study.
- CLIL does not intend to replace textbooks: CLIL provides learners a framework of the core concepts so that, when they find the massive amounts of details in their textbooks, students know how to organize these details so that the details embellish the important concepts.

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"HANDOUT"

TASK 1. Below, you will learn about the heart by matching answers to questions about the heart. In TASK1A, you will create 5 questions about the heart and in TASK1B, you will find 7 potential answers for these 5 questions. Follow the instructions.

TASK-1A (Step 1)

First work individually to decide which option correctly completes the question. Then check with each other. After you all agree, circle the grammatically correct option.

QUESTIONS	ANSWERS
1. How *many/much* chambers does the heart have?	
2. How *many/much* blood does the heart pump each minute?	
3. What are the upper chambers *named/called*?	
4. How are the ventricles, the lower chambers, different *from/different by* the upper chambers?	
5. *Is true/Is it true* that the heart shows left-right symmetry?	

TASK-1B (Step-2)

Below are 7 potential answers to the 5 questions above. Write out the **full** correct answer next to the corresponding question.

a. Yes, it is.
b. Yes, there are.
c. "Atrium" singular and "atria" plural.
d. There are four.
e. They are larger.
f. 4-6 L a minute at rest, and up to 30L/min in endurance athletes!
g. Yes, it does.

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TASK 2A. DINO and EIN

Dino Sauro and Ein Stein are in the same class. They both study very hard but Ein always gets better grades because he knows that it is important to use language *academically*. Dino continues to believe that the only thing that matters is if the information is correct. Look at the two texts and decide which one was written by Dino and which was written by Ein.

The heart has four chambers. The two above on the top are smaller than the two on the bottom. The two on top are called atrium when we speak about only one and when we speak about more than one, we say atria. The chambers on the bottom are called ventricle and ventricles, when there is just one or many. The heart only has two of each of the atria and ventricles and, because the left side of the heart looks like the right side, there is left-right symmetry. Written by: _____	The heart is composed of four chambers. The two upper chambers are called atrium, singular, and atria, plural, while the two lower chambers are called ventricles. The upper chambers, the atria, are smaller than the lower chambers, the ventricles. In addition, the heart shows left-right symmetry so there is a right upper atrium and a right lower ventricle which is symmetrical to a left upper atrium and a left lower ventricle. Written by: _____

TASK 2B. SOUNDING MORE "intelligent"

Both Dino and Ein understand the heart correctly, but Ein uses language in a way that helps him "sound more intelligent." What is the difference? Look at the three sentences below and also the texts in Task-2A: work together to complete Ein's sentences so you also learn Ein's strategy.

This is what Dino might write	This is what Ein might write
There are four chambers in the heart.	The heart _____ _____ _____ four chambers.
The two chambers above on top are smaller than the two chambers on the bottom. The ones on bottom are called "ventricles" but the ones on the top are called "atrium" or "atria": when we speak about just one, we say "atrium", but when plural, we say "atria".	The two smaller _____ chambers _____ _____ "atrium" (_____) or "_____" (_____) while the two _____ _____ chambers are _____ _____.
The right side of the heart looks like the left side of the heart.	The heart _____ _____-_____ symmetry.

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TASK 3A. TWO LINES, FOUR CHAMBERS

The square in Figure 1 is going to be *your* schematic representation of the heart.

- Do you see the four lines numbered 1 to 4? **Ignore them!**
- Do you see the two rectangles labelled A and B? **Ignore those too!**

The only thing you need to do is use the information from Task 1and work together to decide how you should **insert two lines** to divide this square into the four chambers. Before you draw any line, **make sure everyone in your group agrees on where to insert the two lines**.

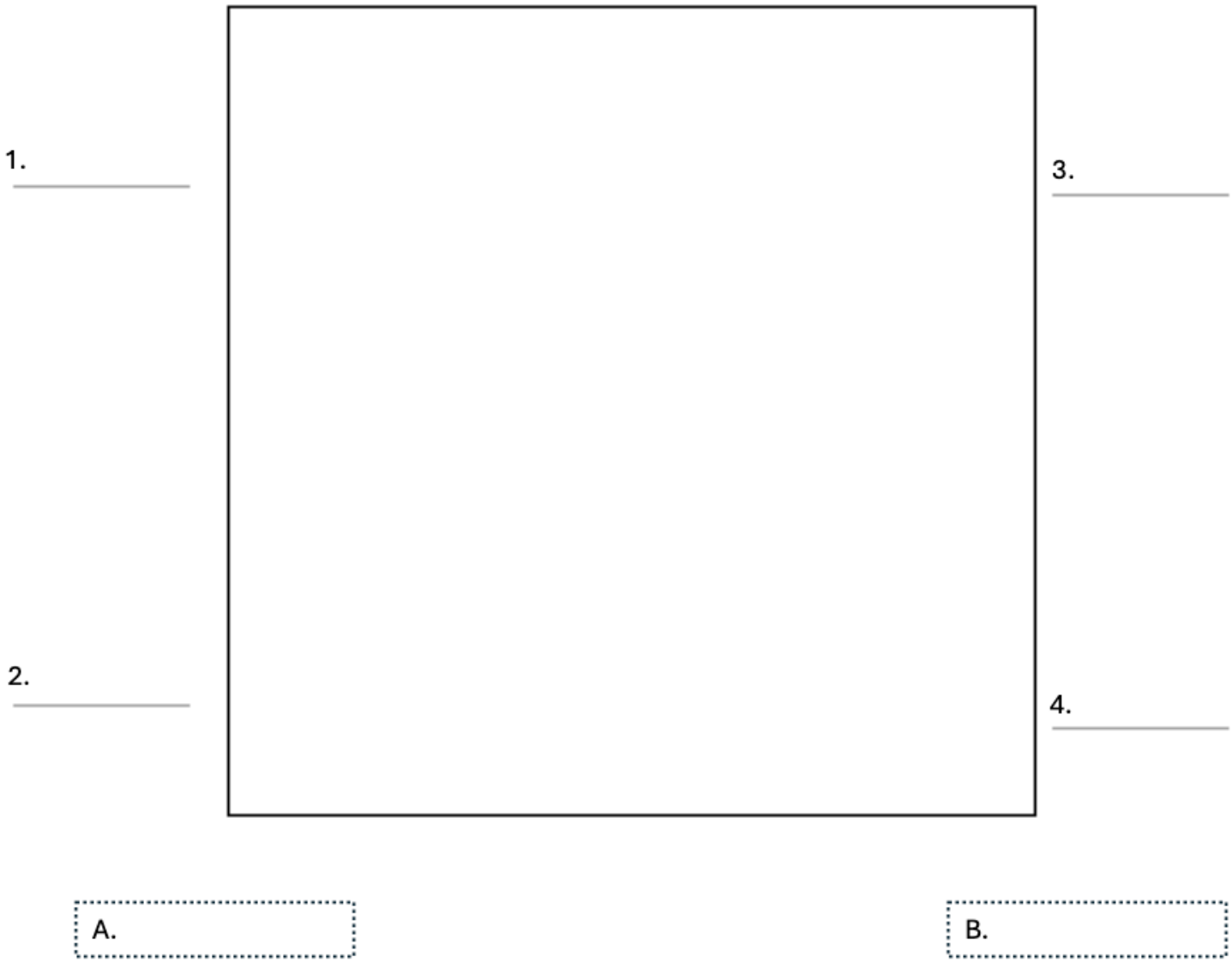

Figure 1. The Heart

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TASK 3B. LABELLING your schematic diagram of the heart

Before we label the heart that you have drawn in Figure 1, complete the following text using (*a*), (*the*) or (nothing).

Now pretend you are _____ surgeon. _____heart you are looking at is _____heart of _____ patient lying on their back. So, in Figure 1, which is _____ right side and which is _____ left side?

Now label _____ Figure 1 by writing "right" in the small rectangle below _____ right side of the patient's heart and "left" in the small rectangle below _____ left side. This is _____ convention that _____ textbooks and exams use to represent the heart.

TASK 3C. LEFT-RIGHT SYMMETRY.

Now that you have identified the **right** and **left sides** of the textbook representation, use the information from Tasks 1-3 to label the four chambers of the heart by writing the following **onto lines 1, 2, 3 and 4** in Figure 1:

- right ventricle
- right atrium
- left atrium
- left ventricle

TASK 3D. NO Left-Right Mixing!

Now use the following types of lines to indicate these two anatomical structures which are like ***solid walls*** separating the chambers:

- the **inter-atrial septum** which separates the **two atria**: a zig-zag line
- the **inter-ventricular septum** which separates the **two ventricles**: a double bold line

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Appendix 1. ANSWER KEY

TASK-1

STEP-1	STEP-2
1. How ***many***/*much* chambers does the heart have?	There are four.
2. How *many*/***much*** blood does the heart pump each minute?	Four to six litres a minute at rest and up to 30L/min in conditioned endurance athletes!
3. What are the upper chambers *named*/***called***?	"Atrium" singular and "atria" plural.
4. How are the ventricles, the lower chambers, **different *from***/*different by* the upper chambers?	They are larger.
5. *Is true*/***Is it true*** that the heart shows left-right symmetry?	Yes, it is.

TASK-2

Left Dino Suaro; Right Ein Stein.

This is what Dino might write	This is what Ein might write
There are four chambers in the heart.	The heart _____is composed of_____ four chambers.
The two chambers above on top are smaller than the two chambers on the bottom. The ones on bottom are called "ventricles" but the ones on the top are called "atrium" or "atria": when we speak about just one, we say "atrium", but when plural, we say "atria".	The two smaller ___upper___ chambers __are__ __called__ "atrium" (__singular__) or "__aria__" (__plural__) while the two __larger__ __lower__ chambers are __called__ __ventricles__.
The right side of the heart looks like the left side of the heart.	The heart __shows__ __left-right__ symmetry.

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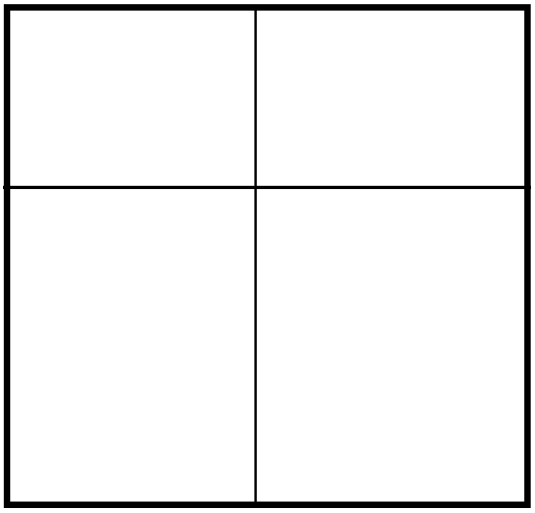
TASK-3A

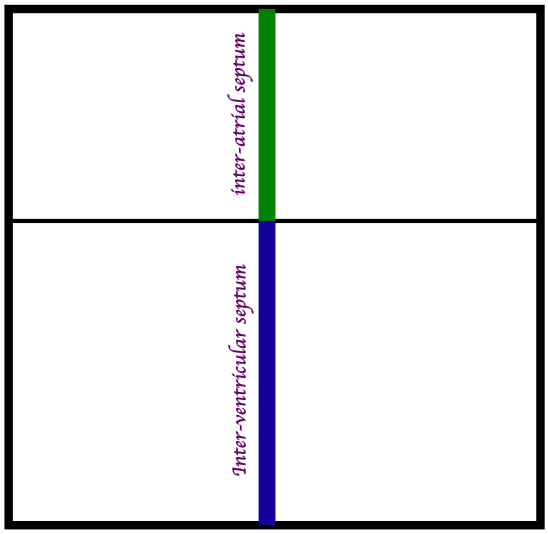


TASK 3B

Now pretend you are ___a___ surgeon. ___The___ heart you are looking at is ___the___ heart of ___a___ patient lying on their back. So, in Figure 1, which is ___the___ right side and which is ___the___ left side?

Now label ___----___ Figure 1 by writing "right" in the small rectangle below ___the___ right side of the patient's heart and "left" in the small rectangle below ___the___ left side. This is ___the___ convention that ___----___ textbooks and exams use to represent the heart.

TASK 3C&3D



right atrium

left atrium

right ventricle

left ventricle

right

left

Appendix 2. RESULTS from Classroom Research

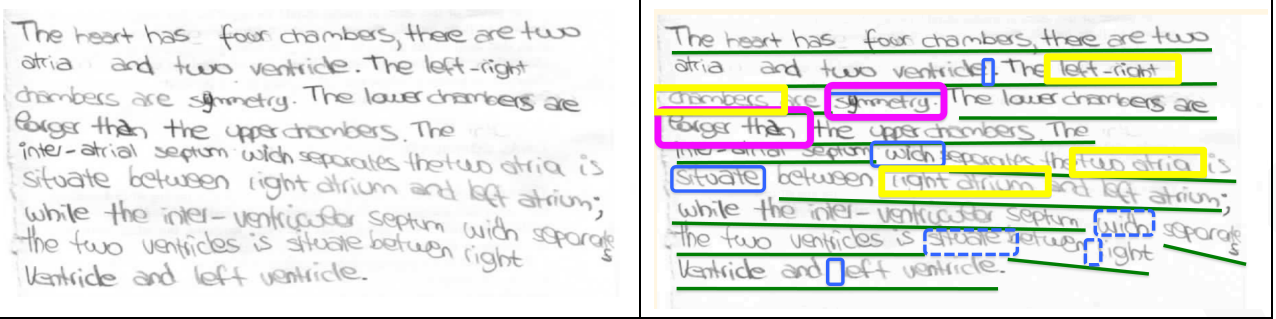
A. Establishing the Learning Objective: Where's the Text!?!

CLIL-teachers first define the age-appropriate discipline-relevant discourse that they want their students to PRODUCE at the end of the CLIL learning progression. This is the target *productive* disciplinary literacy. In the case here, a paragraph like this is what we would want students to be able to write:

BOX-2.

The heart is composed of four chambers, the two smaller upper chambers are called "*atrium*", singular, and "*atria*", plural, while the two larger lower chambers are called "*ventricles*". The heart shows left-right symmetry but under normal conditions there is no communication between the left and right structures of the heart. In fact, the thick *inter-atrial septum* separates the two atria and the very *thick inter-ventricular septum* separates two ventricles.

B. Student's production & Analysis



On the *left* is what a student wrote 25 min into the lesson, after completing Tasks 1-3 above.

On the *right*, an analysis of this particular writing:

- Blue rectangles: grammatical mistakes (e.g. situate → situated; wich → which; two ventricle → two ventricles, etc.)
- Green underline: all correct, from the point of view of language and also content.
- Fuchsia rectangles: indications of self-correction of common English mistakes made by Italian learners of English (e.g. "sYmmetry" corrected from "simmetry" (the letter Y is not part of the Italian alphabet); "larger thAn" corrected from "larger then" (Italian learners of English often confuse "then" with "than" when constructing the comparative adjective).
- Yellow rectangles: in English, the language system of using a hyphen to create compound adjectives or compound nouns, does not exist in Italian.