

Author: Matteo Ianes

# CLIL UNIT PLAN

## PROPORTIONALITY

School level:	<input type="radio"/> Primary <input type="radio"/> Lower-sec <input checked="" type="radio"/> <b>Upper-sec (Technical School)</b>
Year / Class:	<input checked="" type="radio"/> 1 <input type="radio"/> 3 <input type="radio"/> 4 <input type="radio"/> 5
Subject:	Physics
CLIL language:	English
Topic:	Proportionality

Teacher / Teaching team profile	Teacher's role: <ul style="list-style-type: none"> <li><input checked="" type="radio"/> <b>Main Teacher</b></li> <li><input type="radio"/> Co-teacher</li> <li><input type="radio"/> Other: _____</li> </ul>	Subject taught: <b>Physics</b>
---------------------------------	--	--------------------------------

Student group profile  n. of Students: 19	CEFR Level: <ul style="list-style-type: none"> <li><input type="radio"/> A1</li> <li><input checked="" type="radio"/> <b>A2</b></li> <li><input checked="" type="radio"/> <b>B1</b></li> <li><input type="radio"/> B2</li> <li><input type="radio"/> C1</li> <li><input type="radio"/> C2</li> </ul>
	<ul style="list-style-type: none"> <li><input type="radio"/> Previous CLIL Experience: <b>Physics (previous month)</b></li> <li><input type="radio"/> English mother tongue: <b>none</b></li> <li><input type="radio"/> Other mother tongue: <b>Italian, Moroccan Arabic, Wolof, French.</b></li> <li><input type="radio"/> Migrant background: <b>Morocco, Senegal, Mali.</b></li> <li><input type="radio"/> Special Educational Needs: <b>none</b></li> </ul>

<b>Timetable</b> <i>(does the Unit belong to a Module, or to the development of a whole subject on a yearly basis?)</i>	<input type="radio"/> Module <div>           Module length (h) : _____; n. of <i>Units</i> in Module: _____            n. of tuition hours per week: _____         </div>
	<input checked="" type="radio"/> <b>Whole Subject (year)</b> <div>           Lessons per week: <b>n. 8</b> (the entire course is condensed in three months); n. of <i>Modules</i> in a Year: <b>4</b>  <b>THIS Module is the second one.</b> </div>
	<b>Remark.</b> This lesson plan involves only three lessons of a 20-hour module about data processing, proportionality and other relations between physical quantities.

Resources & tools	Interactive smartboard, internet connectivity, laptops, worksheets (digital and paper-based).
-------------------	---

	Subject	Language
	<p>Basic mathematical contents (operations with real numbers, basic geometry formulas, Cartesian plane).</p> <p>Basic abilities in data processing (average, half-the-range, absolute error, relative error).</p> <p>Basic lab abilities (use of measuring instruments, range and accuracy of measuring instruments).</p> <p>Basic abilities with XLS sheets.</p>	<p>BICS.</p> <p>Tenses: present simple, present continuous, past simple.</p> <p>Grammatical structures: zero conditional.</p> <p>Vocabulary: the only required subject- specific terminology concerns lab instruments.</p>

<p><b>Learning Outcomes expected for this Lessons</b></p>	<ul style="list-style-type: none"> <li>▪ <b>Content.</b> Direct and inverse proportionality.</li> <li>▪ <b>Cognition.</b> Creative thinking, analyzing data, peer-assessment, negotiating results.</li> <li>▪ <b>Communication.</b> Speaking and listening to one another, sharing ideas both orally and in written form.</li> <li>▪ <b>Culture.</b> Awareness of the importance of proportionality also in non-scientific contexts (<u>these</u> three lessons only seed the bases to deepen this aspect in the following part of the module).</li> </ul>
---	--

<p><b>Methodology</b></p>	<ul style="list-style-type: none"> <li>▪ All lessons will involve as many skills as possible (reading, writing, listening, speaking) in order to activate language learning processes.</li> <li>▪ Most of the tasks will be designed to be completed in pairs or groups, in order to support interaction and interactive learning.</li> <li>▪ Adequate scaffolding will be provided (see: Materials)</li> <li>▪ In terms of in-task communication, students will be introduced to functional language exponents and lexical chunks to develop both their BICS and CALP competences.</li> <li>▪ The teacher will act as facilitator and guide in all <i>student-centred</i> activities.</li> <li>▪ Continuous and formative assessment will be fostered to include motivation, language use and language accuracy.</li> </ul>
---------------------------	--

# PROPORTIONALITY

## LESSON 1 – DIRECT AND INVERSE PROPORTIONALITY

Lesson Plan:  LESSON 1  (100 min)		Content pursued competence: Direct proportionality. Inverse proportionality.						
		Cross-curricular competence ( <i>Life Skills</i> ): Collaborative and cooperative learning, self-reliance in learning.						
		<b>Expected Outcomes:</b> <i>Most students will:</i> Know the definition of direct and inverse proportionality; know the meaning of proportionality constant; know what the slope of a straight line is. Be able to decide whether two physical quantities are directly proportional, inversely proportional or neither of the two; be able to calculate the proportionality constant which links two physical quantities.						
Activity	Timing (min)	Activity, Aims	Language skills	Materials	Interaction	Activity procedure		Assessment
						T's role	S's role	
1	5	Introduction of learning outcomes.			Plenary	T explains the learning outcomes of the lesson		
2	5	Preparation for next activity.		Laptops (one every two students).	Pairs, whole class	T distributes the laptops and invites Ss to access them and to download all materials for this lesson from a shared folder. <b>Remark.</b> T must have shared all materials in advance.	Access the PCs and download the material.	
3	10	<b>Activity</b> Pair work to discover the content.  <b>Aims</b> To realize the basics aspects of direct proportionality.	Reading a task. Writing the answers to given questions.	Laptops + <u>1.1 Direct proportionality (handout)</u> + <u>1.2 Direct proportionality (simulation)</u>	Pairs	T hands out the worksheets and invites Ss to complete them in pairs, also exploring the simulation. Then T circulates to facilitate.	Ss complete the task in pairs.	Formative: T models content, cognition and language.

4	15	<p><b>Activity</b> Sharing results and formalizing.</p> <p><b>Aims</b> To share results and to build a common knowledge about proportionality.</p>	<p>Speaking in a large group. Listening to each other. Listening to an explanation and reading a definition. Writing notes.</p>		Plenary	<p>T invites Ss to share their results and asks Ss to explain what they have discovered. T writes on the whiteboard the keywords Ss come up with.</p> <p>Then T, using the keywords Ss have proposed, writes the following sentence on the whiteboard, to formalize the concept of direct proportionality: <i>We say that two physical quantities <math>x</math> and <math>y</math> are directly proportional if their ratio <math>y/x</math> is a constant number <math>k</math>. We call that number <math>k</math> the proportionality constant of the two quantities.</i></p>	<p>Ss propose their answers and listen to one another.</p> <p>Then Ss take notes about what T writes on the whiteboard.</p>	Formative: T models and elicits the language.
5	10	<p><b>Activity</b> Exploring the properties of a graph.</p> <p><b>Aims</b> To find a way to calculate the proportionality constant.</p>	<p>Speaking to one another and in a large group.</p>	Laptops + <u>1.3 Slope (simulation)</u>	Pairs, then plenary	<p>T invites Ss to explore the GeoGebra simulation to find a way to discover the proportionality constant from a graph. After circulating to facilitate, T asks Ss to share their results in plenary.</p>	<p>Ss explore the GeoGebra simulation and then propose a way to calculate the proportionality constant.</p>	Formative: T models content and language.
6	15	<p><b>Activity</b> Exercise.</p> <p><b>Aims</b> To put into practice what has been learnt.</p>	<p>Speaking to one another. Writing to answer questions.</p>	<u>1.4 Exercise (handout)</u>	Pairs	<p>T hands out the worksheets and invites Ss to complete them in pairs. Then T circulates to facilitate.</p>	<p>Ss complete the handouts.</p>	Formative: T models content and language.

7	10	<b>Activity</b> Pair work to discover the content.  <b>Aims</b> To realize the basics aspects of inverse proportionality.	Reading a task. Writing the answers to given questions.	Laptops + <u>1.5 Inverse proportionality (handout)</u> + <u>1.6 Inverse proportionality (simulation)</u>	Pairs	T hands out the worksheets and invites Ss to complete them in pairs, also exploring the simulation. Then T circulates to facilitate.	Ss complete the task in pairs.	Formative: T models content, cognition and language.
8	15	<b>Activity</b> Sharing results and formalizing.  <b>Aims</b> To share results and to build a common knowledge about proportionality.	Speaking in a large group. Listening to each other. Listening to an explanation and reading a definition. Writing notes.		Plenary	T invites Ss to share their results and asks Ss to explain what they have discovered. T writes on the whiteboard the keywords Ss come up with.  Then T, using the keywords Ss have proposed, writes the following sentence on the whiteboard, to formalize the concept of direct proportionality: <i>We say that two physical quantities <math>x</math> and <math>y</math> are <b>inversely proportional</b> if their product <math>x \cdot y</math> is a constant number <math>k</math>. We call that number <math>k</math> the <b>proportionality constant</b> of the two quantities.</i>	Ss propose their answers and listen to one another.  Then Ss take notes about what T writes on the whiteboard.	Formative: T models and elicits the language.
9	15	<b>Activity</b> Exercise.  <b>Aims</b> To put into practice what has been learnt.	Speaking to one another. Writing to answer questions.	<u>1.7 Exercise (handout)</u>	Pairs	T hands out the worksheets and invites Ss to complete them in pairs. Then T circulates to facilitate.	Ss complete the handouts.	Formative: T models content and language.

# PROPORTIONALITY

## LESSON 2 – EXPERIMENT DIRECT PROPORTIONALITY

Lesson Plan:  LESSON 2  (100 min)		Content pursued competence: Direct proportionality.						
		Cross-curricular competence ( <i>Life Skills</i> ): Collaborative and cooperative learning, creative thinking, self-reliance in learning, negotiating results.						
		<b>Expected Outcomes:</b> <i>Most students will:</i> Be able to analyze the properties of some quantities and to determine whether they are directly proportional or not, also calculating the proportionality constant (if it applies).						
Activity	Timing (min)	Activity, Aims	Language skills	Materials	Interaction	Activity procedure		Assessment
						T's role	S's role	
1	5	Introduction of learning outcomes.			Plenary	T explains the learning outcomes of the lesson.		
2	5	Preparation for next activity.		Laptops (one every two students).		T distributes the laptops and invites Ss to access them and to download all materials for this lesson from a shared folder. <b>Remark.</b> T must have shared all materials in advance.	Access the PCs and download the material.	
3	10	<b>Activity</b> Designing an experiment.  <b>Aims</b> To design an experiment to determine whether two quantities are directly proportional.	Speaking to one another. Writing to answer questions.	Laptops + <u>2.1 Circle-diameter (simulation)</u> + <u>2.2 Circle-diameter (handout)</u>	Pairs	T hands out the worksheets and invites Ss to complete them in pairs. T asks Ss not to run the simulation until they get to the point in the worksheet where they are expressly invited to do so.	T complete the task in pairs, also using the simulation.	Formative: T models content and language.

4	10	<b>Activity</b> Peer-teaching: sharing and negotiating results to design an experiment.  <b>Aims</b> To complete the design of an experiment to determine whether two quantities are directly proportional.	Speaking to one another to justify choices.		Small groups	T forms small groups making two pairs merge. Then T invites Ss to share their proposals and to come up with a final version of the experiment they will perform.	Pairs merge and Ss share results in small groups.	Formative: T elicits content and language.
5	50	<b>Activity</b> Experiment  <b>Aims</b> To perform an experiment in order to put into practice what has been learnt. To acquire abilities in producing a lab report.	Speaking to one another. Writing a report.	Laptops + <u>2.3 Circle-diameter (lab report)</u> + Experimental material (calipers, rulers, strings, round objects)	Small groups	T invites Ss to perform the experiment by using the experimental material and to complete the lab report at the same time. T tells Ss to complete the lab report by removing the parts in yellow and by completing the tasks on it.	Ss perform the experiment and complete the lab report.	Formative: T elicits content and language.
6	10	<b>Activity</b> Evaluating peers' work.  <b>Aims</b> To analyze and evaluate other students' works in order to improve theirs and own.	Reading other students' lab reports.	Laptops	Small groups	T invites Ss to exchange PCs with lab reports (Group 1 delivers it to Group 2, Group 2 delivers it to Group 3,...). Then T tells Ss that they have to analyze the received lab report in order to formulate some suggestions to improve it.	Ss deliver their lab report to another group and receive another group's lab report. Then Ss analyze it, taking notes, if appropriate.	Formative: T models cognition.
7	10	<b>Activity</b> Analyzing peers' correction.  <b>Aims</b> To analyze and evaluate other students' suggestions in order to improve.	Listening to one another, writing to complete the lab report.	Laptops	Small groups + ambassador	T invites Ss to return the PCs to the original groups and asks one ambassador per group to leave their group to deliver the suggestions.	Ss listen to the suggestions and use them and what they have seen in the other lab report to improve theirs.	Formative: T models cognition.  Summative: T collects (digitally) all lab reports and assesses them.

# PROPORTIONALITY

## LESSON 3 – EXPERIMENT ABOUT INVERSE PROPORTIONALITY

<b>Lesson Plan:</b>  <b>LESSON 3</b>  <b>(100 min)</b>		<b>Content pursued competence:</b> Inverse proportionality.						
		<b>Cross-curricular competence (Life Skills):</b> Collaborative and cooperative learning, creative thinking, self-reliance in learning, negotiating results.						
		<b>Expected Outcomes:</b> <i>Most students will:</i> Be able to analyze the properties of some quantities and to determine whether they are inversely proportional or not.						
Activity	Timing (min)	Activity, Aims	Language skills	Materials	Interaction	Activity procedure		Assessment
						T's role	S's role	
1	5	Introduction of learning outcomes.			Plenary	T explains the learning outcomes of the lesson.		
2	5	Preparation for next activity.		Laptops (one every two students).		T distributes the laptops and invites Ss to access them and to download all materials for this lesson from a shared folder. <b>Remark.</b> T must have shared all materials in advance.	Access the PCs and download the material.	
3	10	<b>Activity</b> Designing an experiment.  <b>Aims</b> To design an experiment to determine whether two quantities are inversely proportional.	Speaking to one another. Writing to answer questions.	Laptops + <b>3.1 Area-level (simulation)</b> + <b>3.2 Area-level (handout)</b>	Pairs	T hands out the worksheets and invites Ss to complete them in pairs. T asks Ss not to run the simulation until they get to the point in the worksheet where they are expressly invited to do so.	T complete the task in pairs, also using the simulation.	Formative: T models content and language.



4	10	<b>Activity</b> Peer-teaching: sharing and negotiating results to design an experiment.  <b>Aims</b> To complete the design of an experiment to determine whether two quantities are inversely proportional.	Speaking to one another to justify choices.		Small groups	T forms small groups making two pairs merge. Then T invites Ss to share their proposal and to come up with a final version of the experiment they will perform.	Pairs merge and Ss share results in small groups.	Formative: T elicits content and language.
5	50	<b>Activity</b> Experiment  <b>Aims</b> To perform an experiment in order to put into practice what has been learnt. To acquire abilities in producing a lab report.	Speaking to one another. Writing a report.	Laptops + <u>3.3 Area-level (lab report)</u> + Experimental material (calipers, rulers, beakers, water)	Small groups	T invites Ss to perform the experiment by using the experimental material and to complete the lab report at the same time. T tells Ss to complete the lab report by removing the parts in yellow and by completing the tasks on it.	Ss perform the experiment and complete the lab report.	Formative: T elicits content and language.
6	10	<b>Activity</b> Evaluating peers' work.  <b>Aims</b> To analyze and evaluate other students' works in order to improve theirs and own.	Reading other students' lab reports.	Laptops	Small groups	T invites Ss to exchange PCs with lab reports (Group 1 delivers it to Group 2, Group 2 delivers it to Group 3,...). Then T tells Ss that they have to analyze the received lab report in order to formulate some suggestions to improve it.	Ss deliver their lab report to another group and receive another group's lab report. Then Ss analyze it, taking notes, if appropriate.	Formative: T models cognition.
7	10	<b>Activity</b> Analyzing peers' correction.  <b>Aims</b> To analyze and evaluate other students' suggestions in order to improve.	Listening to one another, writing to complete the lab report.	Laptops	Small group + ambassador	T invites Ss to return the PCs to the original groups and asks one ambassador per group to leave their group to deliver the suggestions.	Ss listen to the suggestions and use them and what they have seen in the other lab report to improve theirs.	Formative: T models cognition.  Summative: T collects (digitally) all lab reports and assesses them.