

Author: Martina Gelmi
Thermal expansion

School	<input type="radio"/> Primary	<input checked="" type="radio"/> Middle	<input type="radio"/> High	
Year / Class	<input checked="" type="radio"/> 12	<input type="radio"/> 3	<input type="radio"/> 4	<input type="radio"/> 5
Subject :	Science	Topic: thermal expansion		
CLIL language	English			

Teacher / Teaching team profile	Teacher's role:	<input checked="" type="radio"/> Main teacher	Subject taught: Maths and science
		<input type="radio"/> Co-teacher <input type="radio"/> Other: _____	
	Teacher's role:	<input type="radio"/> Main Teacher <input type="radio"/> Co-teacher <input type="radio"/> Other: _____	Subject taught: _____

Student group profile (general)	CEFR Level:	<input checked="" type="radio"/> A1	<input type="radio"/> A2	<input type="radio"/> C1
		<input type="radio"/> B1	<input type="radio"/> B2	<input type="radio"/> C2
	<input checked="" type="radio"/> Experiences of CLIL (10/23 student)	<input type="radio"/> Migrant background	<input checked="" type="radio"/> Special Educational Needs: 2 students with a certification 4 dyslexic students	
	<input type="radio"/> English mother tongue <input type="radio"/> Other mother tongue	<input type="radio"/> Other: _____		
Note: the lesson is mostly active and communicative so everyone can follow it. The way students are grouped takes into account differences among them: weaker students are matched with more able and helpful ones in order to provide a sort of peer tutoring.				

Timetable fit	<input type="radio"/> Module	Previous lessons: states of matters (liquid, solid, gas + plasma); macroscopic proprieties (shape, volume and compressibility) and their explanation from the microscopic viewpoint (molecular structure).
	<input checked="" type="radio"/> Lesson 100 minutes	
		Future lessons: Temperature and its molecular meaning; the thermometer and its graduation (practical activity). Focus on different scales (C, F, K) and cultural aspect. The importance of the International System of Unit for the Scientific community. Phase transition and heat transfer.

Resources & tools	Material from the Science lab: <ul style="list-style-type: none"> • Gravesande's Ring • candle • hot and cold water
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	<ul style="list-style-type: none"> • colorant for water • little flask/bottles (one for each group) • holed corks for the bottles (one for each group) • transparent straws (one for each group) • containers for water in which the little bottles could be inserted (at least 3 for each group) <p>Interactive Whiteboard with presentation (see attA_ppt.ppt) and final game http://learningapps.org/watch?v=pyqm00fit16</p> <p>Material for students: worksheet with activities (see attB_worksheet.pdf)</p> <p>Videos: form Edpuzzle for homework:</p> <ul style="list-style-type: none"> • homework 1: https://edpuzzle.com/media/573f23b4bf63d53841eea097 • homework 2: https://edpuzzle.com/media/573f2c15bf63d53841eedf8f
	<p>Note: all the ICT material would be shared with students using Google Classroom, so that they can use it instead of the book.</p>

	Subject	Language
<p>Students' prior knowledge, skills, competencies</p>	<p>Knowledge: states of matter, molecular structure of different states; macro proprieties of states (shape, volume, compression).</p> <p>Skills: collaborate with others, identify the state of matter of a sample, explain how molecules move and are bound in different states; hypothesise about a fact or phenomenon and follow instructions to follow in an experiment. Deduce conclusions from an experiment.</p> <p>Competencies: use the Scientific Method to explore phenomenon in real life. Renew knowledge based on experience with a new scientific approach. Understand how the microscopic structure of matter influences its macroscopic proprieties.</p>	<p>Present simple Mention of comparative forms Subject language: solid, liquid, gas, plasma, molecules, molecular bounds, volume, compression</p>

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Learning Outcomes expected for this lesson	<p>The student knows:</p> <ul style="list-style-type: none">• what is thermal expansion and its effects on something• thermal expansion happens in different state of matter• the effect of heat on molecules• the meaning of comparative forms <p>The student is able to:</p> <ul style="list-style-type: none">• describe in a simple way the phenomenon of thermal expansion in different contexts• build or give a practical example of how thermal expansion works• understand when thermal expansion has happened to something• solve practical problems using thermal expansions• hypothesise about the result of an experiment• understand instructions• compare facts and phenomena using comparatives of simple adjectives <p>The student is aware:</p> <ul style="list-style-type: none">• of phenomena related to thermal expansion in his/her life <p>[the focus on the cultural part will mainly take place in the next lesson with the analysis of the functioning of a thermometer and its different scales.]</p>
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Methodology	<p>We start from a revision of what has been done in the previous lesson in order to refresh what students are supposed to know.</p> <p>The main guidance for the lesson is the PPT presentation that we are going to follow in order to help students' understanding with images and effects. This is a strategy to overcome the difficulties of language.</p> <p>The lesson features whole class moments, pair work and group work; as a result we would improve both private and public communication.</p> <p>The new topic is presented through an experiment and students are asked some questions in order to organize their hypothesis about it.</p> <p>The experiment will be repeated during the scaffolding step, in which the presentation will help students to understand the effect (objects getting bigger) and cause (molecular movement and energy).</p> <p>After the explanation, students are called to work in pairs and check if they've understood the molecular aspect. This is both a moment for private communication and peer-tutoring.</p> <p>The main activity of the lesson is a hands on activity in which students have to experience thermal expansion in liquids.</p> <p>The result of the experiment will be an instrument students have to use to compare the temperature (but we are not going to define it properly) of some samples.</p> <p>From a linguistic viewpoint the main aim is to make students feel the need of</p>
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	<p>express comparison. In this way it will be more natural for them to use the comparative form of simple adjectives.</p> <p>The communication activity will take place in groups and will focus on what students find out with their new instrument. They will be asked to compare the samples in the group and later with the whole class.</p> <p>The communication activity will go on in the whole class by analysing some practical effects of the phenomenon.</p> <p>Students will be helped by a worksheet to follow; this will give them a main frame in which they can add their notes and help them in improving their learning skills.</p> <p>In the end there will be a revision activity, presented in the form of a game, to repeat the most important points of the lesson, to revise comparative forms and to arouse the curiosity of students about the next lesson.</p> <p>For homework students will have to watch a video and answer to some questions about the same phenomenon in gases.</p>
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Activity	Activity aims	Activity Procedure	Language	Interaction	Materials (please cite all sources)	Timing	Assessment
0	Revise ideas from previous lessons which could be useful in this one.	The teacher uses the PPT presentation and shows some images of objects in different states of matter. Ask students to specify it. Students, then, are asked to compare position, arrangement and movement of different states of matter, by re-using the knowledge of previous lessons.	Vocabulary revision	<ul style="list-style-type: none"> ○ Whole class [the teacher asks questions to students; the teacher decides what to ask depending on the level of the student]	PPT presentation (see attA _ppt.ppt)	10 minutes	This is an informal formative assessment: each student can use it as an indicator of his/her knowledge.

1	Apply the Scientific Method and describe the phenomenon.	<p>“Gravesande's ring”'s experiment is shown to the students by using the material of the lab.</p> <p>Students are asked to answer specific questions. They should discuss in pairs and then each couple has to vote among the options presented.</p>	Passive knowledge of comparatives	Pair work (and then whole class moment to discuss answers)	<p>Material from the Science lab:</p> <ul style="list-style-type: none"> • Gravesande's ring • a candle or Bunsen burner <p>PPT presentation (see attA_ppt.ppt)</p>	10 minutes	
2	Find reasons of the phenomenon in the microscopic approach: scaffolded by the teacher.	Students follow the presentation and the teacher's explanation.	Subject vocabulary. New words: <i>heat</i> (as a verb and as a noun), comparatives.	Whole class	PPT presentation (see attA_ppt.ppt)	15 minutes	
3	Make students reflect on the new ideas in pairs.	Students in pairs deal with activity 1 on the worksheet. Then the teacher uses the presentation to check the answers.	Comparatives	Pair work	<p>PPT presentation (see attA_ppt.ppt)</p> <p>worksheet (see attB_worksheet.pdf)</p>	10 minutes	

4	Hypothesise and experience if the phenomenon happens in liquids: practical activity.	Ask students to hypothesise if the phenomenon happens also in liquids. Then they follow instructions of activity 2 of the worksheet and do an experiment in order to verify their hypothesis. Steps of the experiment can be followed from the IWB where there are more information and picture to make it clearer.	Text genre: instructions New vocabulary (not only subject specific language)	Group work	<p>Experiment material:</p> <ul style="list-style-type: none"> • little bottle/flask • transparent straw • holed cork • coloured water • container with hot and cold water <p>PPT presentation (see attA_ppt.ppt)</p> <p>worksheet (see attB_worksheet.pdf)</p>	20 minutes	Activity 2 of the worksheet will be completed and revised by each student at home and then assessed.
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5	Use of the instrument in order to compare some samples: communication activity.	Each group is given three samples of water (A,B,C) and they have to use the instrument and make comparisons about their temperature. Students have to communicate in their groups and then they are asked to answer about their comparison in front of the class. Students can use Activity 3 of the worksheet as support.	Comparative forms of simple adjectives	Group work and then every group shares its result with the whole class	PPT presentation (see attA_ppt.ppt) worksheet (see attB_worksheet.pdf)	10 minutes	
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6	Find the phenomenon in real life; practice with the language.	The teacher follows the presentation and asks students to choose the suitable words to fill in the gaps. Students work in pairs to find the answer. The checking moment for each of the three practical aspects is integrated with the practical aspect.	New words; practice with comparative forms;	pair work	PPT presentation (see attA_ppt.ppt) worksheet (see attB_worksheet.pdf)	15 minutes	
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6	Final revision and homework	<p>The final revision is presented as a game played on the IWB and allows students to revise both language and concepts.</p> <p>Teacher asks each student to give and answer, in this way she/he can differentiate them among weaker and more able students. The game will lead to finding out another important application of thermal expansion that will be investigated properly in the next lesson: the thermometer.</p> <p>Homework setting.</p>	Revision of language used	Whole class	<p>Learning App: http://goo.gl/fYEIDo</p> <p>PPT presentation (see attA_ppt.ppt)</p> <p>Homework: 1 https://goo.gl/NcGzhQ 2 https://goo.gl/9cwh28</p>	10 minutes	
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