



## S.T.E.A.M. Children Engineer Academy-Greek lesson plans

### LESSON PLAN: 1<sup>st</sup> year – 6<sup>th</sup> Lesson/Mar'18

	<p style="text-align: center;"><b>TITLE</b></p> <h3 style="text-align: center;">Kettle Energy Efficiency</h3> <p style="text-align: center;"><b>Efficiency of a Kettle</b></p> <p><b>Data from experiment</b></p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr style="background-color: #d9ead3;"> <th>water mass (kg)</th> <th>Start Temp (°C)</th> <th>Finish Temp (°C)</th> <th>Temp Rise (°C)</th> <th>Energy (J)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>20</td> <td>100</td> <td>80</td> <td>336000</td> </tr> </tbody> </table> <p><b>Data from kettle</b></p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr style="background-color: #d9ead3;"> <th>Power of Kettle (W)</th> <th>Time to Boil Water (s)</th> <th>Energy Supplied (J)</th> </tr> </thead> <tbody> <tr> <td>2200</td> <td>174</td> <td>382800</td> </tr> </tbody> </table> <p><b>Efficiency of the Kettle</b></p> <div style="border: 1px solid black; padding: 10px; width: fit-content; margin: 10px auto;"> <p style="text-align: center;">Energy Efficiency = <math>\frac{\text{useful energy out} \times 100}{\text{energy in}}</math></p> </div> <p style="text-align: center; color: red; font-weight: bold; margin-top: 10px;">Energy Efficiency = <u>88 %</u></p> <div style="border: 1px solid gray; padding: 5px; width: fit-content; margin: 10px auto;"> <p style="font-size: small;">This calculation is done using a known value called the <b>Specific Heat Capacity</b> of a substance (in this case water). Water needs <b>4200J/kg</b> of energy to raise the <b>temperature of 1kg of water by 1 °C</b>.</p> </div> <div style="border: 1px solid gray; padding: 5px; width: fit-content; margin: 10px auto;"> <p style="font-size: small;">This value is the useful amount of energy supplied to the water.</p> </div> <div style="border: 1px solid gray; padding: 5px; width: fit-content; margin: 10px auto;"> <p style="font-size: small;">This value is the total amount of energy supplied to the kettle from the mains electricity supply.</p> </div> 	water mass (kg)	Start Temp (°C)	Finish Temp (°C)	Temp Rise (°C)	Energy (J)	1	20	100	80	336000	Power of Kettle (W)	Time to Boil Water (s)	Energy Supplied (J)	2200	174	382800
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THEME	Mathematics/Science/Technology																
GRADES	6 <sup>th</sup> Grades																
DURATION	90'(2X45 minutes approximately/per month)																
REALIA-MATERIAS	<ul style="list-style-type: none"> <li>Beaker and kettle</li> <li>Interactive board</li> <li>Experiment in the classroom, showing kettle and beaker boiling time</li> <li>Video showing Boiling <a href="https://www.youtube.com/watch?v=n2v7JaSvI5M">https://www.youtube.com/watch?v=n2v7JaSvI5M</a></li> </ul>																
OBJECTIVES	<p>Through the lesson, pupils will be able:</p> <ol style="list-style-type: none"> <li>1. To compare the water boiling time between a beaker and a kettle, by watching the above video and running an experiment in class.</li> </ol>																

	<ol style="list-style-type: none"> <li>2. To find out that there is a difference in the final water temperature between the water boiled in the beaker and the one in the kettle.</li> <li>3. To learn how to calculate the Energy Efficiency of both the beaker and the kettle.</li> <li>4. To learn how much energy (Joules) is needed for 1kg of water to raise its temperature by 1 degree Celsius.</li> <li>5. To learn to compare the amount of Useful Energy and the Energy supplied.</li> <li>6. Finally, to learn how to solve the Energy Efficiency equation for every boiling utensil.</li> </ol>
DESCRIPTION	<p>Pupils will be shown a video in order to compare the water boiling time between a beaker and a kettle. They will also find out the difference in the final water temperature between the water boiled in the beaker and the one in the kettle immediately after the boiling point. They will be given a data table, so as to note down their remarks along with the experiment. After the end of the experiment they will see the Energy needed for the water to boil in these two different utensils. They will have to calculate the amount of useful energy and the energy supplied in both cases, concurrently realizing the Energy losses. Finally, they must understand that the quotation of this division can never be above 100% because if something like this happened, our planet wouldn't have an energy problem.</p> <p>At the end of the lesson, there is going to be a discussion on the importance of using Low Energy Efficiency Utensils.</p>
EVALUATION	<p>At the end of this two-hour presentation, pupils should be able to</p> <ul style="list-style-type: none"> <li>• Solve the Energy Efficiency Equation</li> <li>• Comprehend that the more quantity of a liquid to be boiled demands more time, more temperature and of course more amount of Energy.</li> <li>• Find themselves if the utensils they use at home, are Energy Efficiency ones.</li> </ul>