

## Teaching Guide

### Water I use in Daily Life

A grade 8 – 9 chemistry module on water hardness

This module covers

- water hardness and usage of hard water in daily life as a problem solving exercise
- investigations that can be conducted by students related to the problem in the laboratory
- work with the information on the use of hard water in daily life

Main moments of the lesson:

problem solving exercise on use of water in household equipment



Conclusion that water contains dissolved matter



Concept of *hard water*



Use of hard water in daily life



What water is in my home/ location



Recommendations that should be taken into consideration when using such water in household conditions

## Learning Outcomes by Lesson

### Lesson 1

Formulates assumption on causes that explain how does matter dissolved in water influences the functionality of the household equipment.

Plans the work progress for water evaporation.

Works in groups, cooperates.

Experiments to establish the composition of water.

Draws conclusions based on the results of an experiment

### Lesson 2

Retrieves the essential from the text on usage of hard water in household conditions.

Knows what is hard water and tells about its usage in daily life.



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Supporting and coordinating actions on innovative methods in science education: teacher training on inquiry based teaching methods on a large scale in Europe

This module was compiled by the Latvian PROFILES team.

Developed by: Jeļena Volkinšteine (2013)

Institution: The Center for Science and Mathematics Education, University of Latvia

Homepage: [www.dzm.lu.lv](http://www.dzm.lu.lv) Mail: [dzmic@lu.lv](mailto:dzmic@lu.lv)



Names the value to be measured during the experiment and creates a table for data registration.

Experiments to establish the hardness of water.

Graphically demonstrates the date obtained in a result of an experiment.

Gives recommendations on the usage of the hard water of the location.

## Suggested Teaching Strategy

### Lesson 1

In order to actualize student knowledge on the topic and promote interest, at the beginning of the lesson ask: “Is it important to know what kind of water we use is our daily life?” allowing the students to freely express their opinion justifying their view. Ask: have you seen an iron with a steam-boiler?” “How does the base of such iron look after a while?” an iron with the steam-boiler can also be demonstrated.

1.

Student activity	What can teachers take notice of/ comments
Brainstorm on possible causes why the gaps on the base of the iron become covered in sediment and sometimes greyish-brownish stains appear on the cloth while ironing. Make a list of the reasons that seem feasible. Discuss this issue with the next group and agree on one assumption, which seems the most suitable.	<ul style="list-style-type: none"> <li>✓ Description of the situation can be read by each student individually or in a group.</li> <li>✓ Pay attention if the students know what distilled water is, explain if necessary.</li> <li>✓ Stress the importance of cooperation in a group.</li> <li>✓ Stress that during the brainstorming all student ideas are accepted.</li> <li>✓ The teacher observes the group work, if necessary assists by asking questions to arrive at the formulation of an assumption.</li> </ul>

1.

Discuss how such a situation could be studied in a laboratory. Develop a step-by-step plan for the research to verify your assumption. Indicate the laboratory accessories and equipment that are necessary to carry out the research.	<ul style="list-style-type: none"> <li>✓ Keep in mind that the assumption must be formulated in such way to be possible verify experimentally.</li> <li>✓ Remind, that the progress of the experiment must be planned step-by-step, to allow other people to repeat it.</li> <li>✓ The teacher observes the group work, assists if necessary</li> </ul>
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2.	When the teacher has approved your plans, carry out experiments to investigate the effects of (a) distilled water, (b) tap water.	<ul style="list-style-type: none"> <li>✓ Pays attention to safety regulations that must be followed by the students during the experiment. If necessary, discuss them in the class.</li> <li>✓ The teacher prepares in advance everything necessary for the experiment, for instance: numbered water samples (of distilled and tap water), a spirit-lamp, crucible tongs, 2 droppers, 2 glass plates, matches.</li> <li>✓ The teacher observes the students at work while performing the experiment, if necessary explains, demonstrates and comments.</li> </ul>
3.	<p>Draws conclusions based on results of the experiment:</p> <ul style="list-style-type: none"> <li>○ On the difference in a composition of distilled and tap water;</li> <li>○ Why do sediment forms on the gaps of the base of the iron and stains sometimes appear on the cloth while ironing;</li> <li>○ On validation of the assumption.</li> </ul>	<ul style="list-style-type: none"> <li>✓ After the experiment the students should have a clear understanding that the water in nature contains dissolved matter which undergo chemical transformation during boiling as a result of which new substances form;</li> <li>✓ They may also be asked why does water in nature contain dissolved matter, if students cannot answer that, it should be explained.</li> <li>✓ Can explain the meaning of the concepts of <i>hard water</i> and <i>soft water</i></li> </ul>
4.	Answers the question: What would you suggest the user of a steam iron to avoid the problems described in abovementioned situation?	<ul style="list-style-type: none"> <li>✓ The situation can be expanded discussing what appliances that make use of heated water are used by the students.</li> </ul>
5.	Discusses and evaluates the group's performance of the experiment by ticking in the table	<ul style="list-style-type: none"> <li>✓ Invites each group to perform self-evaluation accenting how important it is for the group members to discuss every statement.</li> </ul>
6.		

<p>Presents to the classmates on how well did the group do on performing the experiment and cooperating, what and how should be done differently performing a similar experiment next time.</p>	<p>✓ After student presentations the teacher may express their evaluation on how did the students do with the performance of the experiment and cooperation.</p>
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## Lesson 2

Student activity	What can teachers take notice of/ comments
<p>1.1. Reads the text and highlights not less than 5 keywords. 1.2. Discuss them with the group mates 1.3. Formulates three most essential questions that can be answered by the text. 1.4. Formulates questions that arise after reading the text. 1.5. Formulates the main idea of the text. Offers its title. 1.6. Presents their text title, main idea and asks another group the 3 questions.</p>	<p>✓ Explain to the students that the keywords shall be used to formulate questions about this text. ✓ Two groups merge and present what they have done to each other, answer the asked questions. ✓ The teacher observes the student activities and together with the students summarize on the use of the hard water in daily life. ✓ Invites students to name questions that arise while reading this text. Create the list of question on the board. Offer the students to answer them or answer themselves if the students do not have sufficient knowledge or announces when it will be taught.</p>
<p>1.7. Debates with another group! The topic of the debate: Do you agree with the statement that distilled water is <i>alive</i> but hard water is <i>lifeless</i>? Justify your opinion by using the information given in the text or based on your personal experience.</p>	<p>✓ Each group merges with another group it has not yet worked with. ✓ The teacher observes the debate in the groups. ✓ With the help of the students, summarize the debate.</p>
<p>2.1. Reads the description of the experiment <i>How hard</i> and names the value to be measured in order to evaluate the hardness of the water to be tested.</p>	<p>✓ The description of the experiment can be read individually. ✓ The students need to understand that the dependent value to be measured in this experiment is the volume of the soap solution.</p>

<p>2.2. Create a table for data registration. 2.3. Perform an experiment and register your results in the table. 2.4. Graphically demonstrate your results. 2.5. Name the examples of hard water. Explain the results of the experiment with mineral water. 2.6. Name the examples of soft water. Explain the results of the experiment with distilled water. 2.7. Give recommendations on the usage of the hard water of the location and present them to your class mates.</p>	<p>Discuss what the fixed values are.</p> <ul style="list-style-type: none"> <li>✓ Students should be cautioned in advance to bring water from their home or location.</li> <li>✓ Discuss which diagram was chosen by the students and why.</li> <li>✓ The mineral water for the experiment must be with a high level of mineral content. Student can study the label of the mineral water which can help them to explain the results of the experiment.</li> <li>✓ Students pair-up and verbally give each other recommendations on the daily use of water based on the results of the experiment which studied the water brought from their homes or locations.</li> </ul>
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## References

1. Namsone D., Čakāne L., Purmalis J., France I., Volkinšteine J., Locāne A., Brangule A., Gaile I., Logins J., Reinholde A., Dreijalte S., Čudarāne L., Haļitovs M., Pestovs P., Gorskis M., Sirotina E., Pomere I., Rikmanis I., Cīrule I., Halatina I., 2011. *Ķīmija. 8. klase. Skolotājiem*. Rīga, VISC, 124 lpp.
2. Lawrie Ryan, *New Chemistry for You UPDATED*, UK, 2011, 290 – 291.p.
3. <http://lv.lv.allconstructions.com/portal/categories/41/3/0/1/article/476/udens-mikstinasana>
4. [http://www.pvg.edu.lv/datori/konkursi/2009\\_web/vsk/uudens/lapa22.htm](http://www.pvg.edu.lv/datori/konkursi/2009_web/vsk/uudens/lapa22.htm)



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