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**LESSON TITLE:** THE CHEMISTRY OF WATER

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**Disciplines involved:** Chemistry,

**Classes/schools:** Aldini, Buca Mesleki ve Teknik Anadolu Lisesi

**Summary**: Know each other in the level of adressing by name, increase the sensivity to environmental (water) pollution, know the reasons for water pollution, know the chemicals present in the water, detect a problem, construct experiment set up, know the experiment materials, make predictions and observations.

**Target selection:** Our aim in this target is to take the attention of the students to the water pollution. We want to maket hem realize how we can pollute the water via domestic, agricultural usage. We aimed to teach how to measure the parameters of tap water and then to measure the polluted water’s parameters. We aimed to make the students realize the difference between the results.

**Planning:** In order to reach the target, we will use the water test kits (iron,chloride,phosphate, ph paper, amoniac, total hardness, conductivity, oxygen). As we are not chemistry teachers we had to take help from chemistry teachers. The conductometer was hard to find because of its hig price, so we borrowed it from a university. To make sure how the test kits work we did the experiments at school and learnt to use them.

## How to teach the lesson:

## Meeting: (20 Minutes)

Each student will write their names on name tag sized papers cut out from coloured cartons and put them on their collars.

They will be asked to form a circle. In order to introduce the friend near, they will be asked to direct, write and read questions for such as name, age, hobies, phobias, hometown, favourite colour etc.

The students will be seperated in to activity groups (4 groups). Each group will be given a strong rope with both ends tied. The groups are asked to form a triangle and then a square through each member of the group holding the rope. Afterwards they are asked to form a circle an a parallelogram blindfolded.

## Watching The Video And Understanding: (10 Minutes)

THE URL of the video: https://youtu.be/Zk1J2EW-nmQ

**Application Of The Worksheet**: **( 80 Minutes in Total)**

**WORKSHEET**

How do you think the water gets polluted? Discuss this question and write in the table below. **(5 minutes)**

**Domestic pollution:**

The first field of water usage is domestic activities. According to you which works do we do in domestic activities and in these works which substances do we use and result in waste water? Discuss this question and write in the table below. **(5 minutes)**

**EXPERIMENT 1: (35 dakika)**

**MATERIALS:** Water experiment kits

1. You will use the water test kits to measure the clean tap water’s parameters shown in the Table 1 before being used. Note the results from the experiments with the kits in the table 1.
2. In this step you are supposed to put some of the usage aims of water in the first step in to practice. The water on your experiment is tap water polluted by 3-4 drops of liquid soap, 3-4 drops of dish soap,2-3 drops of oil and 1 piece of citrate.
3. You are suppoed to measure the parameters of this polluted water. That’s why measure the same parameters of water using the same test kits and note them in the table below. (table 2).

Now you are supposed to compare the parameters of potable water and water polludted due to domestic usage. For this, compare the rates in table 1 and table 2. Evaluate the differences as increased – decreased or not changed and note them in the table 3.

4. According to Table 3, what kind of changes occured in the parameters of tap water with pollution as a result of domestic activities. Evaluate this in terms of usability.

**Agricultural pollution**

Clean water used in agriculture is not different from tap water in many aspectcts. That’s why we will regard the parameters we measured in the first step as unpolluted agricultural water.

**Experiment 2: (35 minutes)**

**Materials: Water experiment kits**

1. According to you, on what occasions do fertilizers with nitrogen, phosphor and potassium used in agriculture, pollutants containing bluestone, sulphur and lime used as medicine in agricultural spraying can give harm to the environment? Discuss this in your group an write in the box below.
2. Now, suppose that you are dealing with agriculture. You will water the plants with tap water. For this, take the water in the container consisting of some of the chemicals identified above (15-20 pieces of the fertilizer with amonium nitrate (White), 15-20 pieces of the compound fertilizer with ammoniac (Brown) and 15-20 drops of liquid chemical fertilizer).
3. Since your aim is to get more crops in shorter time as growers, more fertilizers than the rates above were added in to water in front of you.
4. You will use the water test kits to measure the parameters of the water below in your container in the end. Note the results you obtained from the experiments with the kits the table below(Table 4).

**5. Let’s compare**

Now you are supposed to compare the parameters of potable water and water polluted due to aggricultural usage. For this, compare the results in the table 1 in the first step with the results in table 4 in this activity. Considering the parameters of the potable water evaluate the differences in polluted agricultural water as increased – decreased or not changed and note them in the table 5.

**Evaluation: (30 minutes)**

**Discuss the questions below in your groups, write them and present with the group spokesman.**

1. On which chemicals will there be increase when domestic waste water is released to water sources like lakes, rivers, streams, seas?

2. Is it possible to prevent pollution completely?

3. Is it right to release polluted water in to the environment without treatment? What kind of harm can polluted water released into the environment directly give to living system?

4. Should chemicals be used in aggriculture? Why?

5. What is the difference between water polluted due to aggricultural usage and water polluted due todomestic usage? Explain.

**Learning targets:** To take the attention of the students to the environmental (water ) pollution. To learn what chemicals can exist in potable water To learn how water gets polluted by domestic, agricultural and industrial reasons by practice and to learn what chemicals can exist in water polluted by these reasons,To develop problem solving skills**.** To develop scientific operation skills**.** To provide students study harmoniously in cooperative learning environment.

We selected these targets to raise attention to the water pollution due to the human usage. Water pollution is directly relevant to the climate change.

**How the learning targets are achieved:** The lesson we planned is appropriate to the learning through living( practising). The stages of the activities are clear, so we aimed to maket he student find the results by themselves. They make the experiments, measure the results, record them and see the differences.

**Evidences:** One of the worksheet the students used during the lesson is attached. As far as we saw all the students groups finished their experiments succesfully, recorded the results and discussed the results in groups. Both teachers dealt with each group individualy and guided them to maket he measurements. The obresver teachers sat behind the class and the groups, sometimes they wondered the measurements, came to the group tables and talked to the students and the teachers.

**Results:** All the students answered the questions after the experiments and the evaluation questions as we expected. Also a good dialog and a good cooperation raised during the lesson. And the students were succesful at using the water test kits. They liked this.

**Discussions:** We learnt that sudents do not know what chemicals exist in tap water and what chemicals are used in agriculture.

**Planning 2(reviewing):** We could have stopped the video at specific times and explain what it meant. We could have prepared a subtitle slide fort he video. We could have prepared a slide show for the procedure. We could reduce the time by explaining the difficulties to the whole class, not one by one. The evaluation part could be beter if the time was managed properly. We didn’t have a summary speech at the and of the lesson due to the time. There could be questions related to metacognitive procedure.

**References:** Water test kits (iron,chloride,phosphate, ph paper, amoniac, total hardness, conductivity, oxygen) and internet.

**Adjoints:** 1- We had some doubts related to the language problem. Because both groups were not native speakers. But that didn’t make big problems.

2-we had great pleasure from the lesson. It was realy a great experince for both of us as this was the first international lesson we have attented.