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| ACTIVITY PLAN | | |
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| **Theme** | **Subtopic** | **Activity Title** |
| 1. Environmental Awareness and Conservation | * 1. Biodiversity and Ecosystems | Investigating Osmosis in Chicken Eggs |

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| Introduction part (or activity overview) |
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| **Introduction part (or activity overview)** | Students watch a video – the naked egg and osmosis (Duration: 5:47 minutes)  [**https://www.youtube.com/watch?v=SrON0nEEWmo**](https://www.youtube.com/watch?v=SrON0nEEWmo)  Use gloves and overalls when handling the food colouring, since it can easily stain.  Corn syrup can be very messy so make sure you have some tissues close by.  Some people are allergic to eggs. If you are one of them, do not worry, use a potato instead (or other vegetables/fruit). http://acaai.org/allergies/types/food-allergies/types-food-allergy/egg-allergy. |
| **SETTING** | A lab/ chemistry classroom or home kitchen |

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| Materials Needed |
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| **Materials Needed** | Egg, Vinegar, Corn Syrup, Container, Spoon, Food Colouring, Apron, Gloves. |

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| **Learning Outcomes** | To demonstrate and compare the effects of osmosis.  To understand how changing osmotic potential effects the net movement of water. |  |
| **Activity Contents** | **Activity 1: Osmosis effect (Duration: 80 min.)**  **Teoretical part:** *Introduction discussion*: (10 minutes)  The teacher introduces the students to the steps of conducting the osmosis experiment. He divides the students into three groups. He gives one group the task of keeping the egg in vinegar for 24 hours, the second group for 48 hours, so that after the first 24 hours they will change the vinegar and the third group will bring an untreated egg.  Step 1: Place the egg very gently into the base of the container. Make sure that the egg does not crack, if it does, replace the egg.  Step 2: Pour vinegar on top of the egg, making sure that the egg is fully submerged.  Step 3: Leave the egg in the vinegar for about 24 hours.  Step 4: If egg shell does not dissolve in 24 hours, replace the vinegar in the container with a new vinegar solution and leave for another 24 hours.  Step 5: When the shell has dissolved, remove the solution and carefully rinse the naked egg.  Step 6: Compare how a normal egg looks with how the naked egg looks.  Step 7: Place the naked egg back in the container.  Step 8: Submerge the naked egg with corn syrup.  Step 9: Bend a spoon and use it to hold down the egg in the container.  Step 10: Leave the naked egg in the corn syrup for a further 24 – 48 hours.  Step 11: Pour out the corn syrup and give the resultant shrivelled egg a rinse.  Step 12: Compare the resultant egg with a normal egg.  Step 13: Fill the container with water, add a few drops of food colouring and stir the solution.  Step 14: Place the shrivelled egg in the container and leave it for a few days (24-48 hours should do).  Step 15: Observe the new egg shape.  **Activity 2: Discussion (Duration: 50 min.)**  The teacher discusses and analyzes connected topics: Osmosis, water molecules, salt concentration, semi-permeable membrane, equilibrium.  Students discuss what they witnessed, what they produced, how was it achieved.  **Example questions (reflection):**  **Why do we remove the eggshell?** To reveal the egg membrane.  **Why does the egg expand in vinegar?** To reveal the egg membrane.  **Why does the naked egg change shape in corn syrup?** Water moves out of the egg.  **Why does the eggshell dissolve in the vinegar?** The acid in the vinegar reacts with the eggshell (calcium carbonate).  **Why did the egg float when left for a couple of hours in the vinegar solution?** Carbon dioxide forms when the egg shell dissolves causing the egg to float.  **Activity 3 – Research (Duration: 30 minutes)**  Students look at some applications and research connected with the topic:  [**https://www.nasa.gov/mission\_pages/station/research/experiments/846.html**](https://www.nasa.gov/mission_pages/station/research/experiments/846.html)  [**http://dc.engconfintl.org/membrane\_technology\_vii/27/**](http://dc.engconfintl.org/membrane_technology_vii/27/)  [**http://puretecwater.com/reverse-osmosis/what-is-reverse-osmosis**](http://puretecwater.com/reverse-osmosis/what-is-reverse-osmosis)  **Additional tips**  Try experimenting with different liquids present in the kitchen and observe their effects on the egg.  Use different sodium chloride concentrations such as 0%, 10%, 20%, 30%…100%. Use a weighing balance to weigh the egg before placing in the saline solution and after. When there is no change in mass, then the solution is isotonic that is the concentration of solutes inside the egg is equal to the concentration of solutes outside the egg.  Try varying the temperatures, to see if temperature has an effect on rate of osmosis. Be careful not to cook the egg though! |  |
| **Assessments** | The final result is evaluated with a grade.  All students in the class can be included in the evaluation.  Each student independently evaluates his contribution to the work.  Students can compete in the best-performed experiment.  The assessment takes into account: student engagement, egg shape, description, costing and conclusions. |  |
| **Key Competences** | Communication competence  Cognitive competence  Competence for creativity  Artistic competence |  |
| **Connections with Eco STEAM** | **Eco** - using natural materials, from the kitchen  **S**ience - knowledge of chemistry, biology and physics; environmental sciences – fostering sustainability thinking.  **T**echnology - using a computer in the research process.  **E**ngineering - electricity production  **A**rt - use of colors  **C**hemistry - preparation of chemical solutions |  |
| **References** | <https://www.youtube.com/watch?v=SrON0nEEWmo>  [**http://www.madsci.org/posts/archives/2002-02/1014825690.Cb.r.html**](http://www.madsci.org/posts/archives/2002-02/1014825690.Cb.r.html)  [**https://www.khanacademy.org/science/biology/membranes-and-transport/diffusion-and-osmosis/v/osmosis**](https://www.khanacademy.org/science/biology/membranes-and-transport/diffusion-and-osmosis/v/osmosis)  [**https://www.exploratorium.edu/cooking/eggs/activity-naked.html**](https://www.exploratorium.edu/cooking/eggs/activity-naked.html)  [**http://dc.engconfintl.org/membrane\_technology\_vii/27/**](http://dc.engconfintl.org/membrane_technology_vii/27/)  [**http://puretecwater.com/reverse-osmosis/what-is-reverse-osmosis**](http://puretecwater.com/reverse-osmosis/what-is-reverse-osmosis) |  |
| **Notes** | / |  |

**Assessment Table for individual work:**

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| Evaluation Criteria | Points | Comments |
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| Understanding the process of osmosis | \_\_/5 |  |
| Communication competence | \_\_/5 |  |
| Cognitive competence | \_\_/5 |  |
| Competence for creativity | \_\_/5 |  |
| Answered questions correctly | \_\_/10 |  |
| Completed homework | \_\_/10 |  |

**Assessment Table for group work:**

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| Assessment Criteria | Points | Comments |
| Internet research skills | \_\_/5 |  |
| Difference in egg size, before and after osmosis | \_\_/10 |  |
| Calculation of cost price | \_\_/5 |  |
| Ecological Interpretations in the project | \_\_/5 |  |
| Teamwork and Collaboration | \_\_/5 |  |
| Skills of presenting the work | \_\_/5 |  |