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| ACTIVITY PLAN | | |
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| **Theme** | **Subtopic** | **Activity Title** |
| 5. Global and Local Perspectives in Environmental Education | 5.2. Local Environmental Challenges and Solutions | DIY Paper  (DIY- "do it yourself") |

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| Introduction part (or activity overview) |
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| **Introduction part (or activity overview)** | Students read info on cellulose and discuss the process of getting paper, share ideas:  [**http://indianapublicmedia.org/amomentofscience/chemical-cellulose-paper/**](http://indianapublicmedia.org/amomentofscience/chemical-cellulose-paper/)  They also watch a video on how to make recycled paper (Duration: 5:24 minutes)  [**https://www.youtube.com/watch?v=RR\_218EtLJU&t=2s**](https://www.youtube.com/watch?v=RR_218EtLJU&t=2s) |
| **SETTING** | Reusing old paper to make your own and understand the fibres that make and break it. |

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| Materials Needed |
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| **Materials Needed** | Wire coat hanger, Mesh material/ tights, A4 sized tray, Newspaper, shredded (4 cupfuls), Mixing bowl, Water, PVA glue, Cotton wool, Food dye, Glitter, Spoon, Plastic bag, 2 sheets of paper towels, 4 sheets of newspaper, Rolling pin |

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| **Learning Outcomes** | To understand the basis of recycling. To understand how paper is made.  To understand the formation and structure of fibres. |  |
| **Activity Contents** | **Activity 1: Realization of the paper making experiment (Duration: 80 min.)**  **Theoretical part:**  *Introduction discussion*: (10 minutes)  **The teacher explains the steps of making paper**  Step 1: Students carefully bend a metal coat hanger into a square and pull a leg of a pair tights over the hanger to make a screen.  Step 2: They cover a tray with several layers of newspaper and two layers of kitchen towels above this.  Step 3: Students use their hands to tear the newspaper into small pieces and put them in a bowl. They make sure they have about 4 cupfuls of shredded paper.  Step 4: Add water until all the paper in the bowl is covered and leave to soak for an hour.  Step 5: Add a tablespoon of PVA glue to the paper and water, then mix with hands to make a pulp.  Step 6: Add cotton wool, food colouring and/or glitter as desired and mix well.  Step 7: Students put the screen on the covered tray and spoon the pulp onto the screen, spreading it out into a thin layer.  Step 8: They put a plastic bag on the pulp and use a rolling pin to even out the mixture and squeeze out the water.  Step 9: Students take off the plastic bag and lift the screen from the tray and place it on the piles of dry newspaper and kitchen paper.  Step 10: Leave the pulp to dry for three days and carefully peel it off the screen.  Students follow the steps of paper making  **Activity 2: Discussion (Duration: 40 minutes)**  The teacher discusses and analyzes connected topics: Cellulose chains, formation of intramolecular bonds, the strongest of which are hydrogen bonds, process of polymerization, formation of fibres, extraction from plant sources, polarity of water, drying and pressing into newly formed sheets of paper.  Students discuss what they witnessed, what they produced, how was it achieved. They share possible solutions to environmental issues, analyse sustainability in terms of reusable paper.  **Example questions (reflection):**  ***Why do we need to use the tights?*** This acts as a screen so excess water can be removed easily.  ***Why do we soak the papers in water?*** To weaken the bonds between paper fibres.  ***Why does paper strengthen when drying?*** The bonds between fibers are being reformed.  ***Why do we cut the paper into smaller pieces?*** To help break apart the fibres and increase the surface area across which any reactions may occur.  ***Why do we mix in cotton wool?*** The cotton makes the paper stronger.  **Additional tips**   * Instead of newspaper try different paper types like printing paper, magazine paper and paper towels. * Instead of paper use really small pieces of plastic, shredded. |  |
| **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 produced paper.  The evaluation takes into account: the quality of the sheet, the cost of production and the artistic expression of the final product in a frame. |  |
| **Key Competences** | Communication competence  Cognitive competence  Competence for creativity  Artistic competence |  |
| **Connections with Eco STEAM** | **Eco** - recycling of old paper .  **S**ience - knowledge of chemistry, biology and mathematics; environmental sciences – fostering sustainability thinking.  **T**echnology - using a computer in the research process and blender  **E**ngineering - frame making  **A**rt - making a picture on the recycled paper.  **M**athematics - calculation of paper recycling costs. |  |
| **References** | <http://indianapublicmedia.org/amomentofscience/chemical-cellulose-paper/>  https://www.youtube.com/watch?v=RR\_218EtLJU&t=2s |  |
| **Notes** | / |  |

**Assessment Table for individual work:**

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| Evaluation Criteria | Points | Comments |
| Quality of produced paper | \_\_/5 |  |
| Understanding the basis of recycling | \_\_/5 |  |
| Understanding how paper is made | \_\_/5 |  |
| Understanding the formation and structure of fibres | \_\_/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 |  |
| Artistic expression of the final product in a frame | \_\_/10 |  |
| Calculation of cost price | \_\_/5 |  |
| Ecological Interpretations in the project | \_\_/5 |  |
| Teamwork and Collaboration | \_\_/5 |  |
| Skills of presenting the work | \_\_/5 |  |