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STEAME ACADEMY

TEACHING FACILITATION LEARNING & CREATIVITY PLAN (L&C PLAN) - LEVEL 2

STUDENT TEACHERS: Tackling Plastic Pollution for a Sustainable Future

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1. Overview

Title	Tackling Plastic Pollution for a Sustainable Future
Driving Question or Topic	<i>Composition of one or small number of essential questions (or related topics)</i> <i>What will happen to plastic production in the near future?</i> <i>How can plastic pollution be avoided, reduced and replaced?</i> <i>What types of plastic can be recycled or must be reused?</i>
Ages, Grades, ...	Age selection: 12 – 14 K-12 grade level selection 6 – 8
Duration, Timeline, Activities	Number of learning Timeline/frame, calendar Number of activities 9 hours: 12
Curriculum Alignment	Mathematics, biology/sciences, arts, entrepreneurship.
Contributors, Partners	
Abstract - Synopsis	<i>This learning and creativity plan aims to raise awareness towards the impact of pollution and stimulate action towards the methods that can be used to reduce the plastic pollution and increase recycling rate. At the initial phase, the process will involve researching data and transforming it to create a better understanding of the gravity of this problem. In the second phase, students will explore, analyze and become aware of the methods of reducing pollution. At the next phase they will design, create products that are directly linked with the topic.</i> <i>At the final stage, students will present and sell what they have created, demonstrating their skills and disseminating the results of their work.</i>
References, Acknowledgements	https://www.youtube.com/watch?v=ju_2NuK5O-E https://greensutra.in/news/plastic-recycling-codes/ https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2873020/ https://ourworldindata.org/plastic-pollution

2. STEAME ACADEMY Framework*

Teachers' Cooperation	<i>Teacher 1 (biology, sciences) will outline the entire process.</i> <i>Teacher 2 (mathematics) will guide students during the activities involving the use of mathematics.</i>
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	<p><i>Teacher 3 (arts) will guide students during the process of designing and creating the magazine and the objects made of plastic garbage.</i></p> <p><i>Teacher 4 (entrepreneurship) will support students to organize and run a fair to sell created products.</i></p>
STEAME in Life (SiL) Organization	<p><i>A fair to exhibit items made of plastics that were discarded and to distribute/sell the magazine.</i></p> <p>Inviting guest speakers from local environmental organizations.</p>
Action Plan Formulation	<p><i>Stage 1: Preparation by 4 teachers.</i></p> <p><i>Stage 2: Action Plan Formulation. The 4 teachers collaborate to create the learning plan and define how to relate the students' outcomes to the curriculum. They guide the students during the phases of the project, according to their specific competences (STEPS 1-2) and they collaborate for the final assessment step.</i></p>

** under development the final elements of the framework*

3. Objectives and Methodologies

Learning Goals and Objectives	<p>Knowledge:</p> <ul style="list-style-type: none"> - Understand the concepts of pollution and <i>recycling</i>. - Compare the data about pollution from different sources. - Identify the types of the plastic and the costs that implies the recycling process. - List the methods for reducing the pollution. - Describe an unpacked store and the consequences of its activity - Distinguish the impact of the pollution. <p>Skills:</p> <ul style="list-style-type: none"> - Analyze data about pollution and its impact. - Work effectively in teams, demonstrating collaborative skills such as communication, active listening, and task delegation to achieve common goals. - Generate original ideas and practical solutions to address identified needs (creativity and problem-solving) - Apply mathematical concepts such as the simple rule of three, algebra to calculate quantities, sums and other parameters relevant to the topic. - Estimate the costs of the recycling. - Create useful objects made of plastic objects. - Design comics about pollution and its impact. - Develop a concept of a magazine about pollution and evaluate its impact on society. - Communicate ideas clearly, using verbal, written and visual communication techniques to convey the consequences of the pollution and benefits of recycling, unpacked stores and reducing pollution. - <p>Attitudes:</p> <ul style="list-style-type: none"> - Maintain an open mindset and curiosity and seek new ideas. - Genuine interest in exploring the broad theme of pollution. - Embrace challenges as opportunities and improvement during the creation of the magazine process.
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Learning Outcomes and expected Results	<ol style="list-style-type: none"> 1. <i>Research the suggested charts and other sources to outline the impact of the pollution</i> 2. <i>Understand the impact of the pollution and the benefits of recycling and reducing the pollution.</i> 3. <i>Create objects out of plastic waste.</i> 4. <i>Design and creation of a magazine, demonstrating the critical application of the identified need.</i> 5. <i>Reflect critically on the social impact of the product they created.</i> 6. <i>Organise an event to sell the magazine and exhibit the created objects</i>
Prior Knowledge and Prerequisites	<p><i>Science, Maths: students should have a foundational understanding of basic scientific concepts and technologies in order to understand the principles behind recycling; Knowledge about designing different types of charts; Apply mathematical principles to calculate dimensions, quantities and other parameters relevant to the discussed topic.</i></p> <p><i>Arts: Basic knowledge about editing programs: Canva, Pixton app or others.</i></p> <p><i>Collaboration skills: experience working in teams will help students to collaborate with their peers.</i></p>
Motivation, Methodology, Strategies, Scaffolds	<p><i>Inquiry-based learning; hands-on activities; group work; PBL.</i></p> <p><i>The main methodologies and techniques of the project are inquiry-based learning and project-based learning. Students are encouraged to explore the material, to organize the material and to ask insightful questions. Students are deeply involved in conducting their scientific research. They build their knowledge through exploration, experience, and discussions.</i></p> <p><i>As they explore this learning plan, students build critical thinking, communication skills and creativity.</i></p>

4. Preparation and Means

Preparation, Space Setting, <i>Troubleshooting Tips</i>	Classroom with tables, computers where students can collaborate, interact and create. Presentation area: in the same class (when presenting the results at an initial phase) or in another space – when organizing a fair for selling the created objects and the magazine.
Resources, Tools, Material, Attachments, Equipment	<p><i>Books, journals, computers for research.</i></p> <p><i>A big number of plastic objects that are not used any more, scissors, paper, hot glue gun etc.</i></p> <p><i>Telephones or cameras to capture the effects of pollution.</i></p> <p><i>Paper and printer for editing the magazine.</i></p>
Health and Safety	<i>Safety rules for outdoor activities and hands-on activities.</i>

5. Implementation

Instructional Activities, Procedures, Reflections	<p>Activity 1 – Brainstorming</p> <p><i>The teacher brings a bucket with a lot of plastic objects and tells the students that he prepared a „Plastic soup” and he will ask students:</i></p> <ul style="list-style-type: none"> • <i>what are the plastic objects made of;</i> • <i>what happens with the plastic objects.</i>
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Activity 2 – Data search and Processing of collected data

The teacher divides the class into 4 groups. Each group will have a complex task to accomplish and then present the results of their work to the whole class. Peer review at the end of this activity.

Moreover, a magazine will be elaborated to draw the attention of the local community to plastic pollution. Students will be informed that each activity in the project will result in the creation of a section of the magazine.

The teacher asks students to watch a short video: Plastic Ocean.

After watching the video, students will answer to some crucial questions:

- What will happen to plastic production in the near future?
- Will we manage to use less plastic and recycle more?

Then the groups will have to access the site OUR WORLD IN DATA

(<https://ourworldindata.org/plastic-pollution>) and analyze the information and find the answers to the questions. The charts contain the following information:

- a) annual production of plastics worldwide (1950–2020) – By how many percent plastic production increased in 2020 compared to 1950? By how many percent plastic production increased in 2002 compared to 1950? Formulate conclusions.
- b) extrapolated plastic fate to 2050. Considering that the worldwide annual plastic production in 2020 was 367 million tones, calculate what will be the quantity of the: incinerated plastic in 2030; recycled plastic in 2030; discarded plastic in 2030. Formulate conclusions.
- c) plastic waste generation by the industrial sector (2015). Given that global plastic production in 2020 was 367 million tones, draw a pie chart showing waste production for each industry sector, expressed as a percentage. Formulate conclusions.
- d) projected share of mismanaged plastic waste in 2025. Considering that the worldwide annual plastic production in 2020 was 367 million tones, calculate the amount of waste produced by each country listed in the diagram. Formulate conclusions.

Activity 3

The teacher presents to the students a short video ([What numbers of plastic are recyclable?](#), on Youtube) about the recycling process and then asks them to access the link - <https://greensutra.in/news/plastic-recycling-codes/>. Students will read, analyze and take notes. Then they will come to the „plastic soup” made by the teacher, choose a plastic object, and explain what type of plastic it is and whether it can be recycled.

Investigate the recycling processes of those 7 types of plastics and the related financial and environmental costs.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2873020/>

They should formulate conclusions and answer a question: Does recycling cost less than producing new plastic objects and packaging?

Activity 4

Students will discuss and find the answer to the question: How can plastic pollution be reduced/eliminated?

Then students will make useful items out of plastic objects that would have ended up in the bin, sculptures etc. and explain the importance of the object they created.

Students will make a list of 10 plastic objects that can be refused, because they have a non-plastic alternative, then undertake little research and calculate the costs for the plastic objects then calculate the price of their non-plastic counterparts. In the end, they should explain what list they will choose and bring arguments.

Activity 5

Students will undertake some research and find out information about the unpacked stores. Then they should:

- *say if unpacked stores are more expensive or cheaper than the usual shops.*
- *say what are the benefits of such shops.*
- *calculate how much waste they would save if they shopped in an unpacked store and compare it to their actual amount (at home they had to count how many plastic items their family throws away each week).*
- *find out how to encourage people to buy products in unpacked shops.*

Plastic pollution can be reduced by introducing taxes on plastic packaging. Students will answer a question: How high would you set such a tax? and will find examples of countries that introduced taxes on plastic packaging.

Activity 6

Students will go outside and make photographs, videos about plastic pollution and its consequences.

Students will create comics about pollution. The Pixton app can be used.

Activity 7 – Creation of a magazine on the impact of pollution on the environment and humanity. *(Maybe the magazine can be digital, not printed. First, to avoid using paper, and second, because in order to make a magazine of a sufficient quality a professional or semi-professional printer is needed, and not all schools have access to one. In this case, the magazine will be sold online)*

Before starting the actual work, students will answer the following questions:

- *How will your magazine relate to existing examples of these media forms?*

- *What conventions have you observed in terms of design, mode of address, use of imagery?*

Then students will discuss and establish:

- *the name of the magazine.*
- *the structure of the magazine (based on the information they found out and presented earlier).*
- *the illustrations that will be used.*
- *the group responsible for each section of the magazine.*
- *the resources they need to realize the magazine.*
- *how it can be launched publicly and how it can be better promoted.*

Then they will create the magazine.

Activity 8 – Presentation of results and of the importance of the created product.

First, the magazine will be presented to the class: each group will present a separate section of the magazine they have been responsible for. Then an overall evaluation will be made to refine some aspects that need to:

- *Correctness of information.*
- *The correspondence of the illustrations with the content.*
- *Relevance of the magazine to the target audience.*

Activity 9 – Conclusion. *Written reflection on the project they completed based on the following questions:*

- *How did you approach the tasks individually and in group?*
- *How did you manage time, equipment and other resources?*
- *Can you provide examples of creative problem-solving decisions you had to make?*
- *What difficulties did you have during the working process?*
- *What would you change in the working process?*

The objects created out of plastic garbage will be exposed and the magazines will be sold during a fair where all the students will be invited and may be parents.

Assessment - Evaluation

Continuous teacher observation, involving review and encouragement. Self-assessment and peer review.

Presentation - Reporting
- Sharing

Almost all the activities involve presentation and sharing of the results.

Extensions - Other
Information

It could be added an activity where students assess the environmental impact of their own project. This could involve calculating carbon footprints, estimating

the amount of plastic diverted from landfills, or measuring the awareness generated within the community.

Resources for the development of the STEAME ACADEMY Learning and Creativity Plan Template

In the case of learning through project-based activity

STEAME ACADEMY Prototype/Guide for Learning & Creativity Approach Action Plan Formulation

Major steps in the STEAME learning approach:

STAGE I: Preparation by one or more teachers

1. Formulating initial thoughts on the thematic sectors/areas to be covered
2. Engaging the world of the wider environment / work / business / parents / society / environment/ ethics
3. Target Age Group of Students - Associating with the Official Curriculum - Setting Goals and Objectives
4. Organization of the tasks of the parties involved - Designation of Coordinator - Workplaces etc.

STAGE II: Action Plan Formulation (Steps 1-18)

Preparation (by teachers)

1. Relation to the Real World – Reflection
2. Incentive – Motivation
3. Formulation of a problem (possibly in stages or phases) resulting from the above

Development (by students) – Guidance & Evaluation (in 9-11, by teachers)

4. Background Creation - Search / Gather Information
5. Simplify the issue - Configure the problem with a limited number of requirements
6. Case Making - Designing - identifying materials for building / development / creation
7. Construction - Workflow - Implementation of projects
8. Observation-Experimentation - Initial Conclusions
9. Documentation - Searching Thematic Areas (AI fields) related to the subject under study – Explanation based on Existing Theories and / or Empirical Results
10. Gathering of results / information based on points 7, 8, 9
11. First group presentation by students

Configuration & Results (by students) – Guidance & Evaluation (by teachers)

12. Configure STEAME models to describe / represent / illustrate the results
13. Studying the results in 9 and drawing conclusions, using 12
14. Applications in Everyday Life - Suggestions for Developing 9 (Entrepreneurship - SIL Days)

Review (by teachers)

15. Review the problem and review it under more demanding conditions

Project Completion (by students) – Guidance & Evaluation (by teachers)

16. Repeat steps 5 through 11 with additional or new requirements as formulated in 15

17. Investigation - Case Studies - Expansion - New Theories - Testing New Conclusions
18. Presentation of Conclusions - Communication Tactics.

STAGE III: STEAME ACADEMY Actions and Cooperation in Creative Projects for school students

Title of Project: _____

Brief Description/Outline of Organizational Arrangements / Responsibilities for Action

STAGE	Activities/Steps Teacher 1(T1) Cooperation with T2 and student guidance	Activities /Steps By Students Age Group: ____	Activities /Steps Teacher 2 (T2) Cooperation with T1 and student guidance
A	Preparation of steps 1,2,3		Cooperation in step 3
B	Guidance in step 9	4,5,6,7,8,9,10	Support guidance in step 9
C	Creative Evaluation	11	Creative Evaluation
D	Guidance	12	Guidance
E	Guidance	13 (9+12)	Guidance
F	Organization (SIL) STEAME in Life	14 Meeting with Business representatives	Organization (SIL) STEAME in Life
G	Preparation of step 15		Cooperation in step 15
H	Guidance	16 (repetition 5-11)	Support Guidance
I	Guidance	17	Support Guidance
K	Creative Evaluation	18	Creative Evaluation