STEAME GOES HYBRID

HYBRID LEARNING & CREATIVITY PLAN (L&C PLAN): Plastic soup (developed from the guide *Supporting Mathematics and Science Teachers in addressing Diversity and promoting fundamental Values – MaSDiV*)

S	T	E*ng*	A	M	E*nt*
☒	☐	☐	☒	☒	☒

This L&C Plan may be implemented:

	Physical Presence		*Hybrid*		*On-line*		*Flip Classroom*	■	*In All Cases*

1. Overview	
Title	**Plastic soup**
Driving question or Topic	How can the plastic pollution be avoided and reduced?
Ages, Grades, … Duration, Timeline,	Ages: 12-14 / 6-8 grades / 4 learning hours
Activities	4 * 60 minutes / 7 activities
Curriculum Alignment Contributors, Partners	Biology, science, mathematics, chemistry
Abstract – Synopsis	*The first 60-minute lesson: the class is divided into groups, and students investigate the most important information about plastic pollution, create content on this topic, reuse plastic objects that were discarded.* *During the second 60-minute lesson, the group work results will be presented.* *The last two 60-minute lessons are devoted to the design, creation and presentation of the magazine.*
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 www.ideekiare.it What Numbers of Plastic are Recyclable? - YouTube

2. STEAME framework	
Teachers' cooperation	*First teacher – Biology/ Sciences* *Second teacher – Mathematics*
STEAME in Life (SiL) Organisation	*A fair to sell items made of plastics that was discarded and to distribute the magazine.*
Action Plan Formulation	*Stage 1: Preparation by 2 teachers.*

	Stage 2: Action Plan Formulation. The two teachers collaborate in order 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.

3. Objectives and methodologies

Learning goals and objectives	*Students will have to:* *- calculate by how many percent plastic production increased in 2020 compared to 1950? By how many percent plastic production increased in 2002 compared to 1950.* *- calculate what will be the quantity of the: incinerated plastic in 2030; recycled plastic in 2030; discarded plastic in 2030.* *- calculate the amount of waste produced by each country listed in the diagram.* *- draw a pie chart showing waste production for each industry sector, expressed as a percentage.* *- sort plastic items according to the number written on it.* *- take photographs about plastic pollution.* *- make videos about plastic pollution.* *- create comics about plastic pollution.* *- calculate how much waste they would save if they shopped in an unpacked store and compare it to their actual amount.* *- create a magazine about plastic pollution.*
Learning outcomes and expected results	*The project aims to raise awareness about the impact of the plastic pollution and to provide possible solutions for reducing it.*
Prior knowledge and prerequisites	*Basic knowledge of mathematics and the ability to decode diagrams*
Motivation, methodology, strategies, scaffolds	*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, discussions.* *As they explore this learning plan, students build critical thinking, communication skills and creativity.*

4. Preparation and means

	Physical Presence	On-line or at distance
Preparation, space, setting Troubleshooting tips Resources, tools, material, attachments, equipment	*Tablets and laptops in order to find out the required information and one laptop for each group to communicate with their colleagues who are online. According to lesson activities, students can work in groups or individually and, sometimes, in plenary session. Telephones, tablets or cameras to take photos or make movies.*	*Tablets and laptops in order to find out the required information. Telephones, tablets or cameras to take photos or film.* *Activities will take place online or*

Safety and health	Equipment will be secured with appropriate antivirus.	at distance according to health rules.

Cloud tools/platforms	Common	
	Cloud tools/platforms used to implement the learning and creativity plan e.g.: 1. Whiteboard.fi 2. Pixton app 3. Google classroom/ Zoom/ Skype	
	Physical Presence	**On-line or at distance**
	1. Whiteboard.fi 2. Pixton app 3. …	4. Whiteboard.fi 5. Pixton app 6. Google Classroom/ Zoom/ Skype

5.	Hybrid learning scenarios (tick the box-es)
	using a camera to show the presentation
V	using share screen to show a presentation
	on-site students sit in front of their screen and adapt to the online students
V	there are 2 cameras: one showing what the students are doing and reacting and one showing the teacher
	do a hands-on activity digitally and adapt to the online environment
	the hands of a student onsite become the hands of the student online
	using platforms that implement experiments digitally
V	having activities that have 2 activities to be done at the same time
	Other

6.	Implementation

Instructional activities, procedures, reflections	The plan can be completed in 4 learning hours. *Step 1* **1. Activity 1 – Brainstorming** The teacher brings a bucket with a lot of plastic objects and tells to the students that he prepared a „Plastic soup" and he invites them to „taste" it. Then the teacher will ask students: ● why is it impossible to eat a „plastic soup"; ● what are the plastic objects made of; ● what happens with the plastic objects. **2. Activity 2 – Data search and Processing of collected data** The teacher divides the class into 5 groups. Each group will have a complex task to accomplish and then presenting the results of their work to the whole class: **1st group:** 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 group will receive some charts (**Annex 1**). Students should 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 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.

2nd group:
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. **Students who are online will do this exercise using plastic items they have at home.**
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 to a question: **Does recycling cost less than producing new plastic objects and packaging?**

3rd group:
Students will discuss and find the answer to the question: **How plastic pollution can be reduced/eliminated?**
Then students will make useful items out of plastic objects that would have ended up in the bin **(Annex 2)** 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.

4th group:
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 to a question: How high would you set such a tax? and will find these numbers.

5th group:
Students will go outside and make photographs, videos about plastic pollution and its consequences.

<table>
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*Students will **create comics** about plastic pollution. The **Pixton app** will be used.*

3. **Activity 3 – Presentation of results.**

4. **Activity 4 – Creation of a magazine on the impact of pollution on the environment and humanity.**

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 persons 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.
5. **Activity 5 – Presentation of results.**

6. **Activity 6 – Analysis of the result obtained.**

7. **Activity 7 – Conclusion.**

</td></tr>
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Assessment – Evaluation Presentation – Reporting – Sharing Extensions – other information	The feedback and evaluation are continuous throughout the actions until the presentation of the results. *At first, the presentation of the results will be done into the class, then if students go to school, they can **organize a fair** where they will sell items made from plastic waste, they can **improvise an unpacked store** to sell fruits, vegetables, nuts, and the buyers will be informed to bring their own fabric bags. During this fair, students' photos and videos can be exhibited, also their magazine can be distributed.*

Distinction between activities that all students can be engaged at, and activities that differentiate in their implementation or totally, between students with physical and on-line participation.	**Common Activity X**	
	Description of the STEAME activity that can be executed by all students. Both those present in the physical space as well as those participating on-line.	
	Individual Activity Y.1	**Physical Groups Y.2**
	Online Groups Y.3	**Blended Groups Y.4**
		All the enumerated activities can be implemented through blended/hybrid groups.

STEAME 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 (STEAME 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 mathematics or other 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
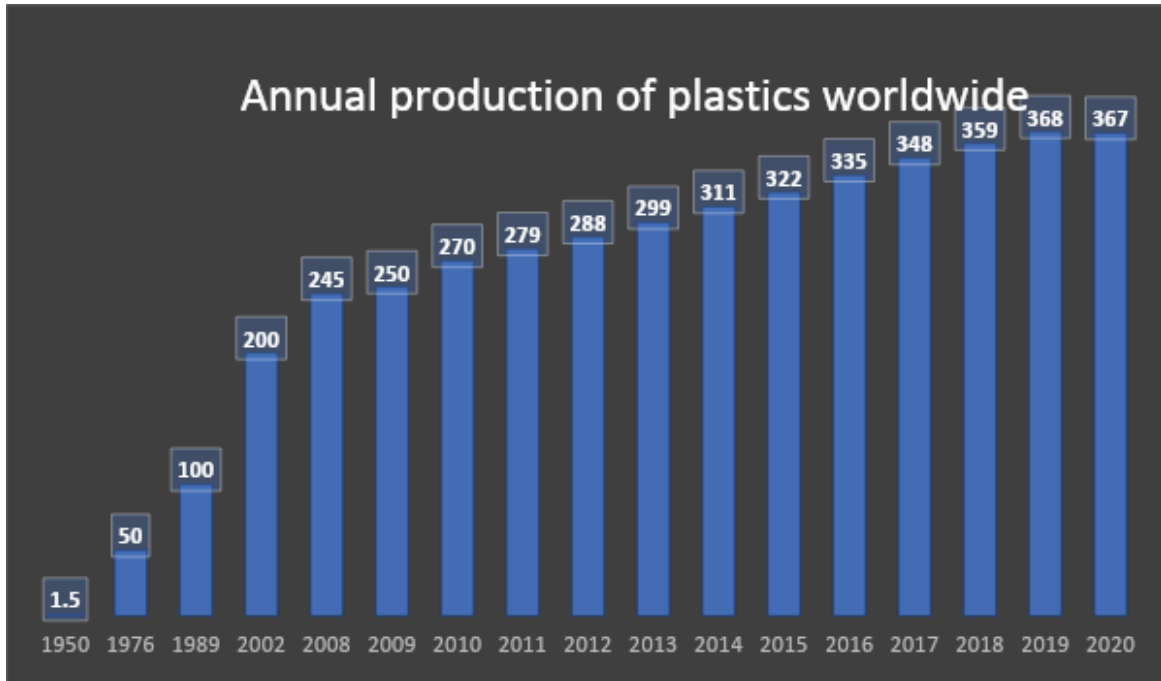18. Presentation of Conclusions - Communication Tactics.

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

Title of STEAME 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

Extrapolated change in plastic fate to 2050, 1980 to 2050

Estimated historic trends in global plastic disposal method (from 1980 to 2015) with extrapolation of past rates of change through to 2050. This gives some indicate of future scenarios based on continued change rates, but should not be directly interpreted as future projections (which cannot assume consistent change over time).
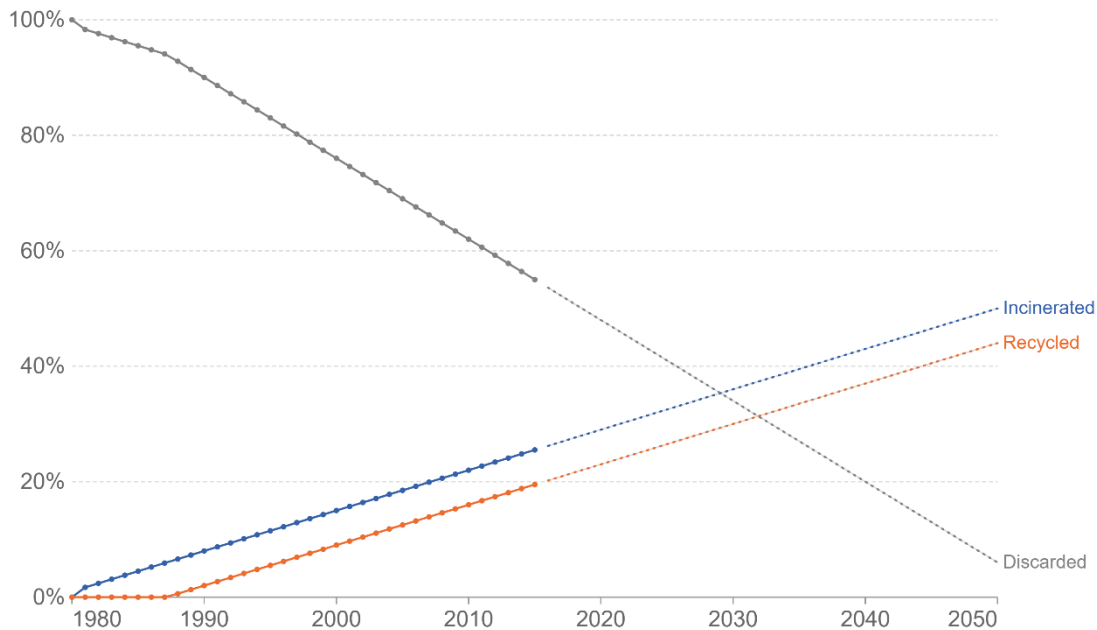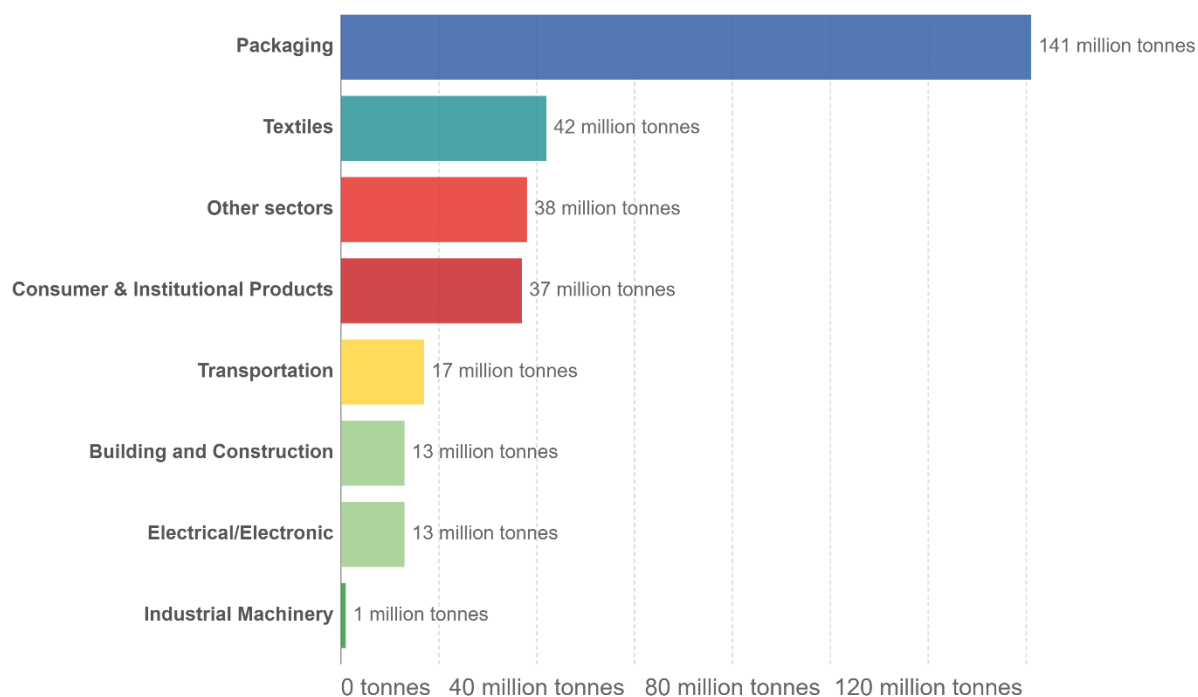

Source: Geyer et al. (2017)

CC BY

Plastic waste generation by industrial sector, 2015

Global plastic waste generation by industrial sector, measured in tonnes per year.

Sector	
Packaging	141 million tonnes
Textiles	42 million tonnes
Other sectors	38 million tonnes
Consumer & Institutional Products	37 million tonnes
Transportation	17 million tonnes
Building and Construction	13 million tonnes
Electrical/Electronic	13 million tonnes
Industrial Machinery	1 million tonnes

0 tonnes   40 million tonnes   80 million tonnes   120 million tonnes
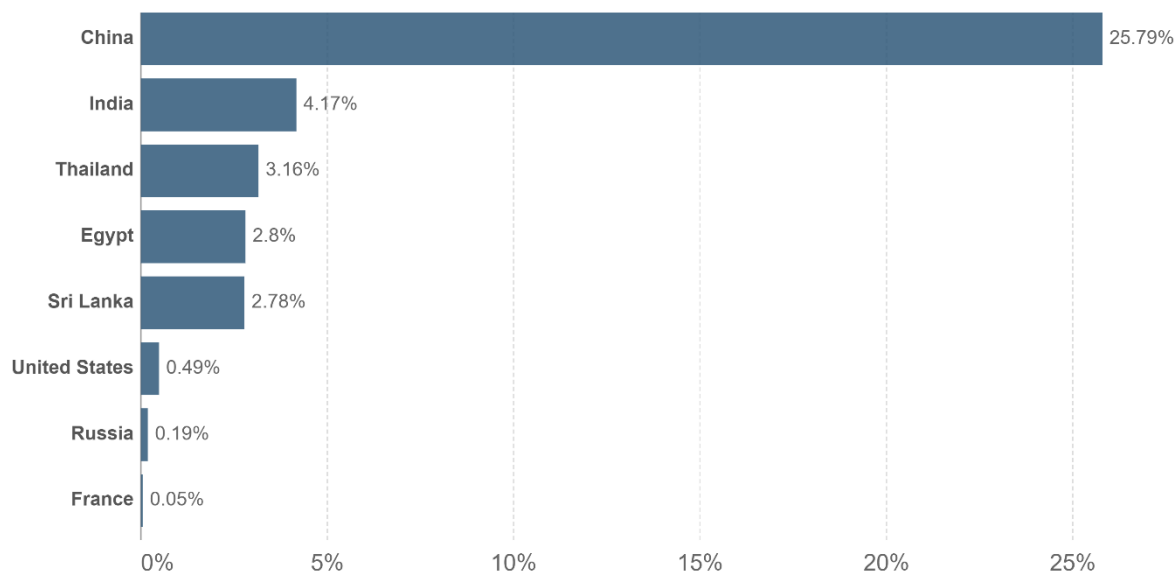
Source: Geyer et al. (2017)   CC BY

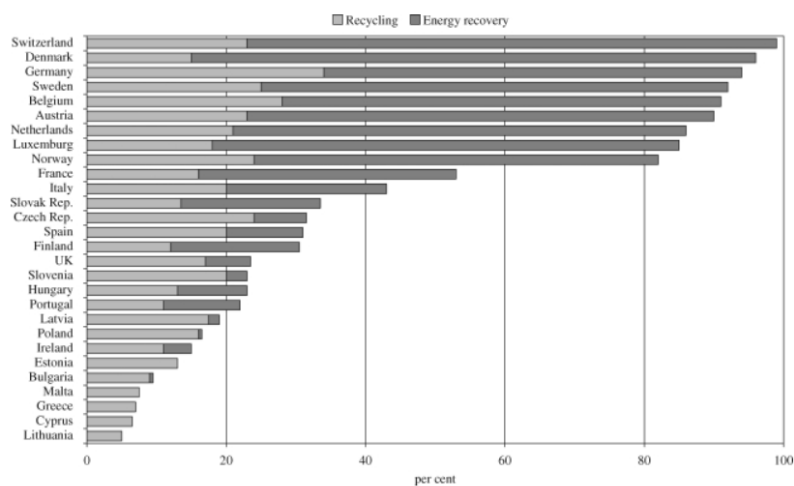# Projected share of global mismanaged plastic waste in 2025

Projected share of global mismanaged waste produced in 2025. This is measured as the total mismanaged waste by populations within 50km of the coastline, and therefore defined as high risk of entering the oceans. Mismanaged plastic waste is defined as "plastic that is either littered or inadequately disposed. Inadequately disposed waste is not formally managed and includes disposal in dumps or open, uncontrolled landfills, where it is not fully contained. Mismanaged waste could eventually enter the ocean via inland waterways, wastewater outflows, and transport by wind or tides."

Country	
China	25.79%
India	4.17%
Thailand	3.16%
Egypt	2.8%
Sri Lanka	2.78%
United States	0.49%
Russia	0.19%
France	0.05%

0%   5%   10%   15%   20%   25%

Source: Jambeck et al. (2015)   CC BY

Figure 1.

Rates of mechanical recycling and energy recovery as waste-management strategies for plastics waste in European nations (PlasticsEurope 2008*b*).

Annex 2

1.

2.

3.

Reciclagem, Jardinagem e Decoração

This Hybrid Learning and Creativity Plan was developed for the purpose of the project: "STEAME GOES HYBRID: Blueprint Guidelines and Policy Recommendations"

HYBRID STEAME LEARNING & CREATIVITY PLAN (L&C PLAN): Research – Services Evaluation

S	T	E_{ng}	A	M	E_{nt}
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This L&C Plan may be implemented:

Physical Presence		Hybrid		On-line		Flip Classroom		In All Cases
							■	In All Cases

1. Overview	
Title Driving question or Topic Ages, Grades, … Duration, Timeline, Activities Curriculum Alignment Contributors, Partners Abstract - Synopsis	**Research – Services Evaluation**

Ages: 13-18	7th - 12th grade	22 learning hours
11 * 90 minutes	4 activities	

Students are involved in a real research process with application in services evaluation. Basic issues and stages of the research process are taught, from the formulation of the problem and the goal to the final presentation of the results and conclusions.

2. STEAME framework	

| Teachers' cooperation

STEAME in Life (SiL)
Organisation
Action Plan
Formulation | • 1st Teacher 1 (T1)- Teacher of Economics, Administrative Science
   Bibliography study, teaching important factors of service quality, presentation of other relevant, similar research.
Classroom or Hybrid or On-line or Flip Classroom.
• 2nd Teacher (T2) - Teacher of Mathematics, Statistics, Research Methodology
   Teaching data collection methods, construction of appropriate questionnaires, sampling methods and techniques, methods of checking the validity of the questionnaire, coding of questions and answers, methods of statistical analysis and presentation of results.
Classroom or Hybrid or On-line or Flip Classroom.
• 3rd Teacher (T3) - Teacher of Mathematics, Statistics, Research Methodology or Computer Science
   Teaching the construction of electronic questionnaires (eg Google Forms) or data entry (in Excel Spreadsheet or other Database).
   Teaching statistical analysis methods and graphical |

	presentation of results (using Excel and Analysis Tool Pak or another statistical analysis package eg SPSS). Teaching the creation of a suitable electronic presentation (PPT or INFOGRAPHICS or VIDEO or PPT with voice over) but also the writing an appropriate detailed report that describes all the stages of the research as well as the conclusions. Computer Lab or Hybrid or On-line or Flip Classroom. This research activity definitely involves representatives from a body that offers the services under evaluation in most of the teaching and implementation stages. **STAGE I**: Preparation by one or more teachers [STEPS 1-3], and **STAGE II**: Action Plan Formulation [Preparation STEPS 1-2]… Refers to the creation of this Learning Plan, by teachers in collaboration . **STAGE II**: Action Plan Formulation [Development STEPS 3-12]… Refers to the realization by the students of the six activities of the Learning Plan. The support, feedback and evaluation by the teachers is accompanying throughout the implementation of the activities and not only the final result.
3. Objectives and methodologies	
Learning goals and objectives	By the end of the L&C Plan, students should be able to know and complete the following: ● Important factors for evaluating Services ● Data Collection Methods and Sampling Methods and Techniques ● Construction and use of appropriate questionnaires (printed or electronic) ● Questionnaire validity and reliability control methods (use of appropriate software) ● Methods of statistical analysis and presentation of results (use of appropriate software) ● Presentation of results - Writing a detailed research report
Learning outcomes and expected results	Upon completion of this research activity, students will be able to follow the stages of a research process, set research goals and objectives, evaluate services or other relative activities, construct questionnaires, collect answers, analyze them and present the results and conclusions of their research. These skills are very important in the 21st century
Prior knowledge and prerequisites	Basic knowledge of descriptive statistics and use of spreadsheets (excel).
Motivation, methodology, strategies, scaffolds	The learning process is based on the involvement of students and their teachers in a real process of evaluating the services of a community service provider that would be of interest to students. The result will be a review or improvement of these services, for the benefit of the service provider (s.p.) and for the benefit of the students or citizens who use these services. The importance of the results is in itself a great motivator.

	On the other hand, the skills acquired throughout the research are also very important for the citizen of the 21st century. These skills are acquired through contacts - consultations with the representatives of the body that offers the services, but also the team work for the construction of questionnaires (printed and electronic), data collection and input, data analysis, presentation of results and drawing conclusions. Throughout this process there is continuous discreet support from teachers and evaluation, feedback for the deliverables at each stage

4. Preparation and means

	Physical Presence	On-line or at distance
Preparation, space, setting Troubleshooting tips	The theoretical framework will be taught in the classroom. However, the students will process the questionnaires (printed or electronic), the data entry, the statistical analysis, and the preparation of the presentation of the results in the computer laboratory (with the support of the teachers).	All the procedures described in the adjacent column can be implemented using hybrid or on-line or flip classroom setting.
Resources, tools, material, attachments, equipment	● Important factors for evaluating Services o [GR] αξιολόγηση των υπηρεσιών - Slideshare o [GR] ΕΝΟΤΗΤΑ_01. Μεθολογία έρευνας o [EN] 3 Ways to Evaluate Your Services - Foto o [EN] How To Measure Quality of Service | Service Quality - Qualtrics ● Data Collection Methods and Sampling Methods and Techniques o [GR] ΜΕΘΟΔΟΙ ΚΑΙ ΤΕΧΝΙΚΕΣ ΔΕΙΓΜΑΤΟΛΗΨΙΑΣ.pdf - ΤΕΙΙΟΝ e … o [GR] ΕΝΟΤΗΤΑ_04. Δειγματοληψία o [EN] sampling ppt - SlideShare o [EN] Sampling techniques - SlideShare o [EN] Sampling Design, Questionnaire Design & Data ib - SlideShare ● Construction and use of appropriate questionnaires (printed or electronic) o [GR] ΕΝΟΤΗΤΑ_02. Σχεδιασμός ερωτηματολογίου o [GR] ΕΝΟΤΗΤΑ_03. Εμφάνιση και προέλεγχος ερωτηματολογίου o [EN] questionnaire design in research - SlideShare o [EN] Questionnaire and its Types - SlideShare o [EN] Top 21 Best Online Survey Software and Questionnaire Tools … o [EN] How to Create a Free Online Survey with Google Docs …		

	● Questionnaire validity and reliability control methods (use of appropriate software)
	
	    o [EN] Reliability test: Compute Cronbach's alpha using SPSS …
	    o [EN] Reliability test: Interpret Cronbach's alpha output in
	    o [EN] Calculating Cronbach's Alpha in Microsoft Excel Compared to …
	
	● Methods of statistical analysis and presentation of results (use of appropriate software)
	    o [EN] How to Use SPSS for Beginners - Online Statistics
	    o [EN] SPSS Tutorial (for Beginners): Learn Online in Simple Steps …
	    o [EN] Use the Analysis ToolPak to perform complex data analysis … (in Excel)
	    o [EN] Jamovi for Data Analysis - Full Tutorial (Free simple Statistical Software)
	
	● Presentation of results - Writing a detailed research report
	
	    o [EN] 5 Ways to Effectively Present Survey Data - Survey Anyplace
	    o [EN] Presenting survey results – Report writing - Queensland …
	    o [EN] AN ASSESSMENT OF THE EFFECTIVENESS OF LIBRARY (report)…
	    o [EN] An Assessment Of The Effectiveness Of Library Resources (ppt)…
	    o [GR] «Αξιολόγηση Υπηρεσιών της Βιβλιοθήκης και Κέντρου …
	    o [GR] Υπόδειγμα γραπτής παρουσίασης έρευνας (pdf)

Safety and health	

Cloud tools/platforms	**Common**

	Cloud tools/platforms used to implement the learning and creativity plan e.g.:
	   1. Cloud Services for organizing material (e.g., One Drive, Google Drive, Teams etc)
	   2. Online Meeting Platforms (e.g., Teams, Google Meet, Zoom etc.)

	Physical Presence	**On-line or at distance**
	3. presentation tools *4. meeting tables* *5. computer, printers*	*6. laptop* *7. …*

	5. **Hybrid learning scenarios (tick the box-es)**
✔	*using a camera to show the presentation*
✔	*using share screen to show a presentation*

✔	*onsite students sit in front of their screen and adapt to the online students*
	there are 2 cameras: one showing what the students are doing and reacting and one showing the teacher
	do a hands-on activity digitally and adapt to the online environment
	the hands of a student onsite become the hands of the student online
	using platforms that implement experiments digitally
✔	*Group work*
✔	*having activities that have 2 activities to be done at the same time*
	other

6. Implementation

Instructional activities, procedures, reflections	The plan can be implemented in 22 learning hours. The first 4 are theoretical but also include a meeting or presence of the representative of the body that offers the services that will be evaluated. The rest include a theoretical framework in parallel with practical application, work monitoring, feedback, evaluation.

1. Important factors for evaluating Services

(4 learning hours)

T1 teaches the important factors of service quality assessment. Meetings (or presence in the classroom) are arranged, with a representative of the body that provides specific service/es that will be evaluated, to make the target and the goal of the research more specific. Bibliography is reviewed to find a possible similar procedure followed by other relevant bodies.

2. Data Collection Methods and Sampling Methods and Techniques

(2 learning hours)

T2 teaches the methodology of a research process, as well as the various data collection methods and sampling techniques. Students under the guidance of their teacher are asked to choose the appropriate methodology for their own research.
Teaching methods of data collection, construction of appropriate questionnaires, methods - sampling techniques, methods of checking the validity of the questionnaire, coding of questions and answers, methods of statistical analysis and presentation of results.

3. Construction and use of appropriate questionnaires (printed or electronic)
Questionnaire validity and reliability control methods (use of appropriate software)
Methods of statistical analysis and presentation of results (use of appropriate software)

(8 learning hours)

T2 and T3 in collaboration teach students how to construct appropriate printed or electronic questionnaires. They also teach ways to encode questions and answers, and to enter data or prepare the database for processing.
The theoretical framework as well as the use of appropriate software for checking the validity and reliability of the questionnaire, as well as basic methods of statistical analysis of questionnaires are also taught.
After completing the theoretical framework, the students are divided into |

	groups.
	The 1st group deals with the construction of the questionnaire with appropriate questions, the 2nd group is trained in the conversion of the questionnaire in electronic form or in the coding and data input and the 3rd group is trained in data analysis methods using appropriate software. The groups interact with each other both in the initial stages and afterwards.
	After the questionnaire is constructed in its first version (printed or electronic) it is given for testing to a small group of people.
	The questionnaire is checked if it is legible, with simple and understandable questions, if bias is avoided from the wording of the questions, if the questions measure what we want, etc. Then the appropriate interventions are made for the final form of the questionnaire that will be available for the main survey.
	From the first, small-scale sharing of the questionnaire, some initial conclusions or some points may emerge that may need more detailed investigation and may need to be included in the final form of the questionnaire.
	It may be that at some points clarifying open-ended questions need to be added (eg indicate what additional service you would like this service body to offer.)
	At this stage, all three groups of students we mentioned work together.
	The final questionnaire is then shared to the sample selected for the main survey.
	4. Presentation of results - Writing a detailed research report
	(8 learning hours)
	Until the questionnaires and the data collection is completed, T3 teaches students methods for effectively presenting the results and writing a research report.
	When the answers of the questionnaire are collected (all students participate in this process), the first preliminary analysis of the answers is done with simple descriptive statistics. In the first presentation of the results, we have preliminary conclusions and further research issues are discussed and formulated for a more detailed analysis of the questions, in topics that may be of interest, e.g.
	•Checking the differentiation of the answers according to various demographic data (eg Age, Gender, Area, Educational Level, etc.)
	• Correlations or groupings of the questions
	• Reliability Test
	Detailed Statistical Analysis is performed, and appropriate graphics are used for better presentation of the conclusions.
	The presentation of the results as well as the writing the research report is being prepared.
	At this point students can work again in groups both to investigate with statistical methods the various questions, but also to prepare the individual stages of the presentation or research report.
	Alternatively, students can work in groups and each group can prepare different presentations and reports.
Assessment – Evaluation	T1, T2 and T3 provide ongoing support, feedback, and evaluation. The feedback and evaluation is continuous, from the point of construction of the appropriate questionnaire and throughout the process of conducting the research, the analysis and the presentation of the results.
Presentation – Reporting – Sharing	The presentation of the results will be done in front of the representatives of the body that provides the services, but possibly also in front of all the interested students of the school. Presentation is expected to be done by

Extensions – other information	groups of students in sharing. Both the presentation and the research report can be published on the school website or the websites of the community or the service provider. The results will certainly be the trigger for the specific body that offers the services to take actions to improve and modernize the processes and services it provides.

Distinction between activities that all students can be engaged at, and activities that differentiate in their implementation or totally, between students with physical and on-line participation.	**Common Activity X**
	The theoretical framework that will be taught, the preparation and the process the questionnaires (printed or electronic), the data entry, the statistical analysis, and the preparation of the presentation of the (with the support of the teachers) are all common activities but some of them can be separated and assigned to different groups

Individual Activity Y.1	**Physical Groups Y.2**
● Attending and studying the theoretical background for conducting a service evaluation research, and writing-presenting suggestions and conclusions.	● Meetings with a representative of the body that provides specific service/es that will be evaluated, to make the target and the goal of the research more specific. ● If a printed questionnaire is to be distributed, they must print, distribute, collect the questionnaires, and enter the answers into the database.

Online Group Individual Y.3	**Blended Groups Y.4**
Students working in the same groups from remote locations, dividing activities between them such as: ● Preparing an appropriate questionnaire and its distribution to the target group. ● Statistical analysis of responses. ● Writing a detailed research report. ● Preparing a presentation of the results, suggestions, and conclusions.	Different groups of students can undertake the following procedures: ● Preparing an appropriate questionnaire and its distribution to the target group. ● Statistical analysis of responses. ● Writing a detailed research report. ● Preparing a presentation of the results, suggestions, and conclusions.

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HYBRID STEAME LEARNING & CREATIVITY PLAN (L&C PLAN): The creation of my own e-shop

S	T	E_{ng}	A	M	E_{nt}
☐	☒	☐	☒	☒	☒

This L&C Plan may be implemented:

	Physical Presence		Hybrid		On-line		Flip Classroom	■	In All Cases

1. Overview	
Title Driving question or Topic Ages, Grades, … Duration, Timeline, Activities Curriculum Alignment Contributors, Partners Abstract - Synopsis	THE CREATION OF MY OWN E-SHOP WHAT I NEED TO KNOW ABOUT THE COSTS, REVENUE AND PROFIT IN MY BUSINESS?

Ages: 15-16	9th - 10th grade	4 learning hours
2 * 90 minutes	6 activities	

Five activities for two learning periods of 90 min (first lesson) include the analysis and the calculation of a firm's profit, the analysis of its costs and how this firm creates and increases its revenue. So, for all these reasons, in the second period of 90 min (second lesson), every group of students designs and creates a customized e-shop, that formulates a real problem. In this way, they understand the mechanism of the market in action.

References – acknowledgments:
• Pearson Edexcel International GCSE (9-1) Economics -First published 2017, author: Rob Jones. ISBN 978-0-435-18864-1 (Student's book). Case Study (Lesson 16): Greenway Construction (activity 1).
• Pearson Edexcel International GCSE (9-1) Economics -First published 2018, author: Clare McCormack. ISBN:978-0-435-19134-4 (Teacher Resource Pack).

2. STEAME framework	
Teachers' cooperation STEAME in Life (SiL) Organisation Action Plan Formulation	*1st Teacher: Economist* *2nd Teacher: Technology Specialist and/or Computer Scientist* *(the two teachers can work together during the second lesson)* *A real meeting with a businessman whose main activity is organizing and running an e-shop.* *STAGE I: Preparation by two teachers [STEPS 1-4],* *STAGE II: Action Plan Formulation [Preparation STEPS 1-3]* *Refers to the creation of this Learning Plan, by the two teachers in*

	collaboration,
	STAGE II: Action Plan Formulation [Development STEPS 4-14, 16-17]. Refers to the realization by the students of the six activities of the Learning Plan,
	STAGE II: Action Plan Formulation [Completion STEPS 15, 18]. Refers to the evaluation by the teachers [15], and the presentation by the students of their results [18].

3. Objectives and methodologies

Learning goals and objectives	*By the end of the L&C Plan, students should define and calculate (in euros):*
Learning outcomes and expected results	• *total revenue*
	• *total fixed costs*
Prior knowledge and prerequisites	• *total variable costs*
	• *total costs*
Motivation, methodology, strategies, scaffolds	• *average total costs*
	• *profit*
	After the project, learners will be able to investigate the market and become more competitive using new technologies. This procedure develops their critical mind and fosters their curiosity about new markets and about their future as entrepreneurs. Their communicative skills and their ability to collaborate will be enhanced, as they will be obliged to make decisions as partners. The result will be the virtual e-shop with the aid of spreadsheet for billing and pricing the product.
	Basic knowledge of mathematics and spreadsheet document, global market perception (comparing prices and features)
	The main methodologies and techniques of the course are based on inquiry-based learning. In this way, students are encouraged to explore the material, prioritize data, ask questions and share ideas. Inquiry-based learning uses different approaches to learning, including small-group discussion and guided learning. Students are involved in designing and conducting their own scientific research after having some queries and case studies. Specifically, students learn by making their own e-business, instead of memorizing facts and material. This allows them to build knowledge through exploration, experience and discussion. In addition, students get the chance to explore economic terms more deeply and learn from their own first-hand experience. Students have the opportunity to investigate a problem and find possible solutions, make comments and questions to test ideas, think creatively and use their intuition.
	As they explore this Learning Plan, students build critical thinking and communication skills. The cognitive skills that students develop can be used to improve comprehension in every subject, as well as in day-to-day life. Last but not least, team working, and brainstorming can get the student on the path to success.

4. Preparation and means

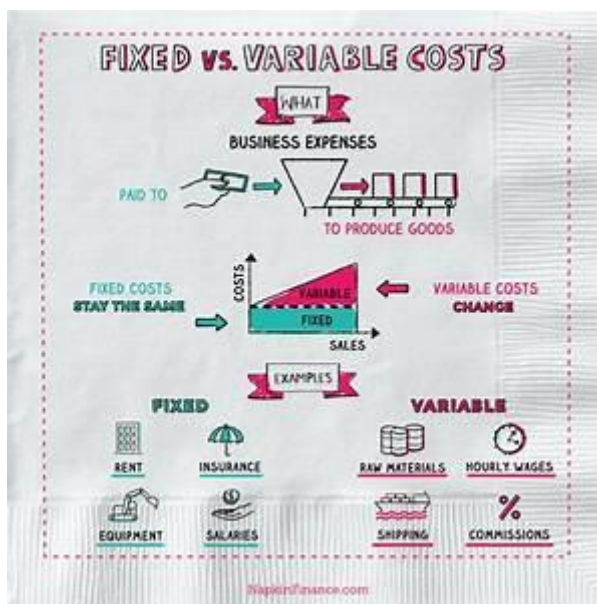| Preparation, space, setting Troubleshooting tips Resources, tools, material, attachments, equipment	**Physical Presence**	**On-line or at distance**
	Students that are physically present at their class take their sits in their learning space (desk, meeting table,	*Students with on-line presence are situated in front of their digital devices in a space that allows them to concentrate,*

Safety and health		*informatics laboratory PC station, etc.)* *Students will have to utilise the schools access on the internet.* *Cyber security safety are the main security and health issues to consider. Usually centrally managed either by the school or the national authority.*	*engage and interact.* *Students will need a stable and descent internet connection.* *Cyber security safety are the main security and health issues to consider. Usually centrally managed either by the school or the national authority.*
Cloud tools/platforms		**Common**	

		A free design platform of the Internet will be the basic tool and with the use of spreadsheet document, students will make the appropriate calculations for the final pricing of the product. Tablets and laptops in the classroom, will be necessary for students, in order to investigate the market and of course to develop their e-business. According to lesson activities students could work or individually or in groups of 4-5 students or in plenary session.
		   1. *"The logo Game" application: apps.apple.com/us/app/logo-game-quiz/id953721694*
		   2. *Infographic "Fixed vs Variable Costs": napkinfinance.com/napkin/fixed-cost-vs-variable-cost*
		   3. *Calculation of the profit: news.wtm.com/wp-content/uploads/2016/12/Profit-Feature.jpg*
		   4. *Kahoot: kahoot.it/*
		   5. *e-Shop creation: https://www.shopify.com*	

		Physical Presence	**On-line or at distance**
		Students work digitally through their portable devices transferring the learning process completely on-line therefore the tools used are common.	*Students work digitally through their portable devices transferring the learning process completely on-line therefore the tools used are common.*

5.	**Hybrid learning scenarios (tick the box-es)**
	using a camera to show the presentation
X	*using share screen to show a presentation*
X	*onsite students sit in front of their screen and adapt to the online students*
	there are 2 cameras: one showing what the students are doing and reacting and one showing the teacher
	do a hands-on activity digitally and adapt to the online environment
	the hands of a student onsite become the hands of the student online
	using platforms that implement experiments digitally
	having activities that have 2 activities to be done at the same time
	other

6.	**Implementation**
Instructional activities, procedures, reflections Assessment – Evaluation	*The plan can be completed in four learning hours, the two first hours with 5 activities related to the understanding and analyzing the billing of a product and the two second hours with one activity, which is the creation of their own e-business.*

Presentation – Reporting – Sharing Extensions – other information	
Distinction between activities that all students can be engaged at, and activities that differentiate in their implementation or totally, between students with physical and on-line participation.	**Activity 1 – Brainstorming (20 min.)**
	First of all, students are divided into groups of 4-5 persons. The teacher gives them a worksheet without explain anything or analyze the economic terms. With the help of the following infographic, students will try to answer the questions.
	Activity 2 – Game for finding the well-known logos (5 minutes)
	Students play with "The Logo Game" application that shows various images of business logos (or parts of logos) and ask users to identify each business.
	Activity 3 – Playing with quizzes about the six terms (15 minutes)
	Students working either individually or in small groups, play a Kahoot quiz-game prepared by the teacher. They try to answer multiple choice questions on the 6 economic terms without being taught it, with what they have understood from the first activity.
	Activity 4 – Playing with quizzes about the six terms (15 minutes)
	Teacher's presentation and plenary discussion, based on students' findings of the previous activities, defines the terms: costs, average costs, revenues and profit. The correlation with examples from real life is important and helpful. Through calculations and small case studies, students answer 5 multiple

choice questions in the end of the presentation.

Pro£it = Revenue -Cot

To increase this: increase this   or   decrease this

Activity 5 – Case study (20 minutes)

In the end of the first lesson, students will summarize their knowledge via the worksheet, as a case study. This case study will help them to organize the data (table) and apply all the terms that they have already learned. The questions, based on the STEAME investigative approach, develop their critical minds.

Activity 6 – Creation of the e-shop (90 minutes)

As far as the application of this activity is concerned, students will separate in groups and every group will choose the product or the service which it wants to produce and promote. They are going to investigate the market, to locate suppliers and learn about similar businesses (competitors). The creation of the e-shop has been implemented via PowerPoint Presentation or via the free Platform ''shopify''.

- *A self-assessment with immediate results, is the Kahoot game (activity 3).*
- *A group-assessment is the multiple-choice questions and the small case studies in the end of the Teachers' Presentation (activity 4).*
- *An evaluation using a rubric with four criteria, is the worksheet submission (activity 5).*

Apart from their ability to perceive and apply the economic terms, we can monitor their collaboration skills, during the above two activities.

A presentation by each group takes place as an extra activity (an additional 20-minute lesson), analyzing the steps from the billing until the pricing of the product. Students should present all the variables that take into consideration in order to complete the e-shop.

Event - real meeting with executives of a big firm with well-known products and on a call (via teleconference or face to face) and with a businessman whose main activity is organizing and running an e-shop.

![STEAME GOES HYBRID]

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HYBRID LEARNING
& CREATIVITY PLAN : OPEN AIR MUSEUM

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This L&C Plan may be implemented:

	Physical Presence		*Hybrid*		*On-line*		*Flip Classroom*	■	*In All Cases*

1. Overview	
Title Driving question or Topic Ages, Grades, … Duration, Timeline,	**OPEN-AIR MUSEUM** How does art reflect the community? How does technology connect to art?

Ages: 13-14	7-8 grades	15 learning hours (* 60 minutes)
	10 activities	

Activities Curriculum Alignment Contributors, Partners Abstract - Synopsis	*Brief description of the project and of the learning activities related with the activities* The project design includes the analysis of territorial and environmental realities through the search and picture taking of public art sites, the production of a virtual walking tour and the creation of original model sculptures with a public proposal to install them in city sites. Through the exercise of skills like creativity, problem solving and digital competences for research and cooperation, students understand how their work can impact on the community and relate knowledge to the management of real life problems. The plan is adaptable to various teaching-learning environments where hybrid activities need to be designed: inability for students/teachers to be physically present in schools due to pandemics or natural disasters or in cases of collaboration between different schools in joint projects. The plan is inspired to a project called " Kinetic Conundrum " **https://www.edutopia.org/video/anatomy-project-kinetic-conundrum** The fully 'in presence' version of the plan was originally designed within the EU project *"STEAME Guidelines for Developing and Implementing STEAME schools" -* STEAME Further references: PBL and Arts: Empowering Students to Craft Beautiful Work - YouTube (about cross-curricular, arts-infused project-based learning)

2. STEAME framework	
Teachers' cooperation STEAME in Life (SiL) Organisation Action Plan Formulation	1st Teacher: Art and /or social sciences 2nd Teacher : Technology Specialist and/or Computer Scientist A meeting with local authorities members (town planning office) at the beginning of the project to define collaboration and on completion of the project for the presentation of the results. Students or students' representatives can take part in the meeting (students' voice). Realisation mode: in presence / online or blended through a video conferencing platform: Google Meet / Zoom or similar. **STAGE I**: Preparation by two teachers [STEPS 1-3] **STAGE II**: Action Plan Formulation [Preparation STEPS 1-10] The two teachers collaborate to create the learning plan. They define how to connect the project outcomes to the curriculum, they set project goals and, if necessary, they assess the teachers' competences for the project. The Technology teacher may build a model prototype with the aim to show students a possible result, but not for them to copy.

3. Objectives and methodologies	
Learning goals and objectives	By the end of the L&C Plan, students will ● find the answer to the guiding questions and so they will know how art reflects the community and how technology connects to art as an expression of people and culture. ● Identify the type of artistic, cultural and environmental assets present in their territory ● Know and compare the different expressive techniques, traditional and multimedia ● Be able to identify simple elements and procedures present in complex processes and objects, allowing them to be reused in the implementation of different but conceptually similar processes. ● Be able to formulate hypotheses, detect and process data, evaluate results, compare phenomena attributable to the same model of communicating using the technical language correctly. ● Be able to operate intellectually and manually for an intentional and verifiable result as a synthesis of a cognitive, scientific process. ● Be able to verbalise the products made with the appropriate, specific terminology. ● Be able to use a variety of digital tools to collaborate in a hybrid educational environment ● Be responsive and adapt to new learning methods and contexts
Learning outcomes and expected results	● Learners will gain a better knowledge of the artistic aspect of the area they live in and become more competent using new technologies to shape their achievements. ● This procedure develops their critical mind and fosters their curiosity about the social environment and awareness of their creative abilities. ● Their communicative skills will be enhanced, as they will work in groups and be obliged to relate to the social context and to new studying and working requirements and experiences. ● The tangible results will be the virtual tour on Google maps and the model sculpture created.
Prior knowledge and prerequisites	● The basic structures of visual language ● The codes and compositional rules present in works of art and in multimedia communication (use resources also available from the Internet) ● Basic knowledge of how to place works of art in their respective historical environmental contexts ● Use of the most common technical terms relating to proceedings : units of measurement and calculation techniques; geometric design ● The concept of relationship and proportion and basic concepts related to materials

Motivation, methodology, strategies, scaffolds	● Basic operational skills, in accordance with safety and accident prevention regulations
	● Tools and techniques for creative personal production: questionnaires and investigation tools, specifically cloud/ digital tools
	● Representing and expressing what has been observed and one's personal experiences

The privileged methodological approach is the communicative-laboratorial one. A methodology of discovery and research in terms of lived experiences will be applied. Students' work is not reduced to manual skills - even if it includes them – but it is assumed as a fundamental didactic element. It has a formative value because motivated activities of a problematic type are favored. Motivating activities arise from the individual and collective needs. To achieve the objectives, the inductive method and the problem solving methodology are used: concrete problem situations that arouse the interests of the students and take into account the technical concepts through reflections on the text, research activities, laboratory and operational processes. Within these methodologies, the design method is used, leading to the solution of a problem through technical analysis, direct or comparative observation and the realization of simple technical-operational activities aimed at acquiring skills and the consolidation of concepts.

A variety of media and methods including synchronous and asynchronous activities.
will be employed to provide a mix of online and face-to-face learning. Instructional differentiation will be necessary for meeting students' needs in relation to their learning environment: in presence/ at distance or blended and consequently to the different roles and degrees of independence that will be assigned to students during the activities and to the multi-modal representations.

4. Preparation and means

	Physical Presence	On-line or at distance
Preparation, space, setting Troubleshooting tips	Tablets , laptops and IWB in the classroom (or a media lab), digital cameras or cell phones to take pictures will be necessary for students, in order to research the topics and develop their virtual city tour; art supplies , shop tools . According to activities students will work individually, in pairs /groups or in blended plenary sessions. Other spaces: school auditorium or gym for the final event	Tablets , laptops , digital cameras or cell phones to take pictures will be necessary for students working from home or at a distance , in order to research the topics and develop their virtual city tour; art supplies , shop tools that can be available in the home: boxes, glasses, sheets of paper, pieces of wood, metal wires, plastic wrappers. According to activities students will work individually, in pairs /groups or in plenary sessions through collaboration and communication cloud platforms (GSuite tools) Other spaces: school auditorium or gym for the final event, fitted with video-conferencing equipment..
Resources, tools, material, attachments, equipment	1.**Support material for phase 1 activities** City/town videos https://www.youtube.com/results?search_query=city+tours+ Google maps application (my maps) https://www.google.com/maps/about/mymaps/ (application) https://www.youtube.com/watch?v=QIvxXUzc2U8 (tutorial on how to create a map) 2. **Instructional videos and lesson plans for various types of sculpture building** :	1.**Support material for phase 1 activities** City/town videos https://www.youtube.com/results?search_query=city+tours+ Google maps application (my maps) https://www.google.com/maps/about/mymaps/ (application) https://www.youtube.com/watch?v=QIvxXUzc2U8 (tutorial on how to create a map) 2. **Instructional videos and lesson plans for various types of sculpture building** :

| Safety and health | https://www.youtube.com/results?search_query=how+to+create+kinetic+sculpture (selection of videos) Kinetic Sculpture - Art-O-Motion - Lesson Plan - YouTube (PDF version of lesson plan : Layout 1 (ctfassets.net) Art-O-Motion 2 - Lesson Plan - YouTube (PDF version: art-o-motion-2-kinetic-sculpture.pdf (ctfassets.net) STEM At Home Episode #7: Building a kinetic sculpture - YouTube #stemathome - YouTube (selection of ideas) Grade 10 Kinetic Sculptures - YouTube How to Make a Mobile - #1 Thing You Need to Know - YouTube Scale Model Trees / 9 Ways (How To Make) - YouTube Making Pinwheels from Aluminum Cans with Cardboard - YouTube

3. **Worksheets for activities and assessment :** group – work assessment sheet

https://www.schrockguide.net/assessment-and-rubrics.html (a collection of multipurpose rubrics) https://www.slideshare.net/carlyrelf/grade-8-hivrubricnov2011 (assessing a multimedia product) https://www.studentartguide.com/articles/how-to-analyze-an-artwork https://www.edutopia.org/pbl-assessment-resources How to measure effectiveness of a virtual tour (showyour.space) (ways for assessing a virtual tour)

Architectural analysis. https://docs.google.com/document/d/1wmF5d_X5ddZMvDTppqjSPetzHgF-DMfZWiPgmUUiro0/edit?usp=sharing *Self-evaluation Chart.* https://docs.google.com/document/d/1hj69FfmrasdSSZdPYCruHuUYOBchIG3umIhKFqPcjHw/edit?usp=sharing *edutopia-rubric:* https://docs.google.com/document/d/1OmLlNoF_H-q3Gu1OSxV6R6VuInN4vsNA_Rr2BgYcvEA/edit?usp=sharing | https://www.youtube.com/results?search_query=how+to+create+kinetic+sculpture (selection of videos) Kinetic Sculpture - Art-O-Motion - Lesson Plan - YouTube (PDF version of lesson plan : Layout 1 (ctfassets.net) Art-O-Motion 2 - Lesson Plan - YouTube (PDF version: art-o-motion-2-kinetic-sculpture.pdf (ctfassets.net) STEM At Home Episode #7: Building a kinetic sculpture - YouTube #stemathome - YouTube (selection of ideas) Grade 10 Kinetic Sculptures - YouTube How to Make a Mobile - #1 Thing You Need to Know - YouTube Scale Model Trees / 9 Ways (How To Make) - YouTube Making Pinwheels from Aluminum Cans with Cardboard - YouTube

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Architectural analysis. https://docs.google.com/document/d/1wmF5d_X5ddZMvDTppqjSPetzHgF-DMfZWiPgmUUiro0/edit?usp=sharing *Self-evaluation Chart.* https://docs.google.com/document/d/1hj69FfmrasdSSZdPYCruHuUYOBchIG3umIhKFqPcjHw/edit?usp=sharing *edutopia-rubric:* https://docs.google.com/document/d/1OmLlNoF_H-q3Gu1OSxV6R6VuInN4vsNA_Rr2BgYcvEA/edit?usp=sharing |
| **Cloud tools/platforms to implement the L&C plan** | **Common** |

		1. Gsuite for education- Apps and collaboration tools	
		2. Video – conferencing platforms : Zoom – Teams	
		3. Google maps – My maps	
		4. Canva	
		5. Mindmeister – mind mapping tool – brainstorming tool), Stormboard, Padlet	
		Physical Presence	**On-line or at distance**
		6. Gsuite for education- Apps and collaboration tools	9. Gsuite for education- Apps and collaboration tools
		7. Google maps – My maps	10. Google maps – My maps
		8. Canva	11. Canva

	5. Hybrid learning scenarios (tick the box-es)
x	*using a camera to show the presentation*
x	*using share screen to show a presentation*
x	*onsite students sit in front of their screen and adapt to the online students*
x	*there are 2 cameras: one showing what the students are doing and reacting and one showing the teacher*
x	*do a hands-on activity digitally and adapt to the online environment*
x	*the hands of a student onsite become the hands of the student online*
	using platforms that implement experiments digitally
x	*having activities that have 2 activities to be done at the same time*
	other

	6. Implementation
Instructional activities, procedures, reflections	The plan can be completed in 3 main phases , the first phase (3 hours with 3 activities) relates to the research, analysis and understanding of existing landscape features ; the second phase (2 hours with 2 activities) includes the creation of the first tangible product , the virtual tour and an interim assessment session. The third phase (10 hours and 5 activities) culminates in the creation of students' own personal sculptures and connects the whole project to real life issues.

STEP 1 Research and photograph public art sites (1 hour in blended class context – 1 hour field work + 1 hour blended plenary session +writing activity)

- **Activity 1: brainstorming /motivation and video analysis**
- **Activity 2 : field work**
- **Activity 3: description writing**

In the art class the teacher presents the project idea and the driving questions through video conferencing to a group of students in attendance and another group of students connected online . Through screen- sharing mode all students are then presented with a video focussing on the architectural features of their city. They are encouraged to express their reactions on positive aspects they value and negative aspects they would want to improve. An online brainstorming tool (e.g. Padlet) can be used for students' collaboration.

The teacher presents a selection of public art pieces/installations to study. Students are divided into groups of 4 persons. Each group will work on 1 or 2 art pieces (depending on the size of the class and the pieces involved). The task is to go around the town and photograph the chosen installations. This can be done as a group or individually by each student. The students are given a worksheet (architectural analysis worksheet) to guide them in retrieving relevant information from the research and the direct observation of the artworks (more able students may be given a less structured task). The type of information collected will guide them later on in the project for the construction of their personal model structure.

The worksheet will be available for all students on their digital Classroom (GSuite) for them to print if necessary. As a home assignment all students , working online , will share the information they have found and, in their groups, write their own description of the pieces of art chosen, including relevant discoveries and personal impressions.

Architectural analysis.
https://docs.google.com/document/d/1wmF5d_X5ddZMvDTppqjSPetzHgF-DMfZWiPgmUUiro0/edit?usp=sharing

Step 2 Place information on Google maps to create a walking tour (2 hours)

- **Activity 4 : creation of multimedia product**
- **Activity 5: assessment**

The descriptions and pictures are loaded on Google maps- my maps whereby all the different public art sites will be connected as a walking tour. Students create a virtual tour, by clicking on the piece of art on the map, it will show the information that they have found and written about. The activity can be carried out by students at home (at a distance) collaborating with students in the computer lab at school in either way: a) with students at home directing their mates at school or b) with students at home and at school in groups /pairs uploading the material on Google maps while being connected through video conferencing.

The virtual tour will be uploaded on the school website. The students and teachers can evaluate the quality of the virtual product created by comparing it to similar existing products and by testing its useability with other students , teachers and parents. For testing the useability of the product different methods can be used: How to measure effectiveness of a virtual tour (showyour.space)

Self-evaluation Chart.
https://docs.google.com/document/d/1hj69FfmrasdSSZdPYCruHuUYOBchIG3umIhKFqPcjHw/edit?usp=sharing

STEP 3 a. - Writing a proposal for the installation of an original artifact (30 minutes)

- **Activity 6: letter writing**

In the language arts class, (plenary session in blended mode) students write a mail to city officials with proposals for the installation of their original works that they are going to build, together with an invitation to participate in the final event. In this way students will relate to the community needs, show artistic appreciation of their realities and show awareness for the improvement of the city landscape.

STEP 3 b. - Designing and building a model of an artifact/ sculpture (5 hours + 30 minutes ideation as home assignment)

- **Activity 7: model project design**
- **Activity 8: sculpture building**

The students, in pairs, design their original sculpture models first as a home assignment; in the tech class (blended environment – students at a distance paired with students at school) the students finalise their projects. They then build it. The rationale behind the activity is that students have fun and learn to be creative; they get to think about something, and in the creation process are encouraged to experiment and to develop problem solving abilities (tinkering). The activity is carried out in pairs. In a hybrid environment the activity can be carried out in different ways: a) as the materials used will be easily available even in the home: boxes, glasses, sheets of paper, pieces of wood, metal wires, plastic wrappers, the paired students can simultaneously build similar artifacts b)

the students at a distance can guide their mates in the lab in the process of constructing the artifact.

Several techniques and materials can be employed to build different kinds of sculptures, according to the time available, to the experience of the teacher guiding the students and to the level of ability of the students themselves. The videos and material provided in the 'preparation section' of this plan can be useful to gather ideas and procedures for different kinds of work.

Self-evaluation Chart.
https://docs.google.com/document/d/1hj69FfmrasdSSZdPYCruHuUYOBchIG3umIhKFqPcjHw/edit?usp=sharing
edutopia-rubric:
https://docs.google.com/document/d/1OmLlNoF_H-q3Gu1OSxV6R6VuInN4vsNA_Rr2BgYcvEA/edit?usp=sharing

STEP 3c . Preparing material for presentation   (1 class hour + 1 hour homework)

- **Activity 9: written report/leaflet/ presentation PPT or video**

After completing their work, the students will arrange for documenting their project result: a written report / leaflet /PPT/video by means of sharing cloud tools (Google docs – Google slides) with pictures and technical specifications and detailed description of their sculpture to go along with the oral public presentation. The students in class will then work on the written report and leaflet. The students from on remote will work on the PPT presentations or video.

STEP 3 d- Display model and discuss work at a public event. (2 hours)

Activity 10 : model sculptures display

The model sculptures will be displayed at a public event. The students will describe them with the help of the leaflets created and discuss their installation proposals with parents and members of the community. On the occasion they will answer questions on how they made their sculpture, how the sculpture works and why they chose to make that particular piece. The members of the public will vote for the most interesting sculpture. In this way the students get engaged in the work that they have done , they take ownership of the work and feel responsible for it . They are able to talk about the things that they have learnt. In compliance with learning goals the students develop critical and socially engaged intelligence, which enables them to understand and participate effectively in the affairs of their community in a collaborative effort to achieve a common good. (John Dewey: Project on Progressive Ed)

The event can take place in the school auditorium or gym, fitted with video-conferencing equipment to allow participation of students and some or possibly all members of the public at a distance. As for the presentation, the students at school can display the physical artifact and provide leaflets while their mates can share their screen for the presentation / description of the project through (Google Slides – Canva – Screencast-o-matic)
The voting can be arranged online through survey tools (e.g. Google forms) .

Students' learning and progress will be monitored and measured. Assessment and formative evaluation processes and rubrics to measure the students' ability to perform what was described in the objectives as have been indicated previously:
- A *self-assessment after stage 2 and stage 4,*
- A project –evaluation *rubric at the end of the project (Edutopia rubric model)*
- Evaluation of the 'Virtual tour' through users' responses on school website posting
- Informal assessment : results of the competition during the display phase

Short presentations by each group takes place during plenary sessions to show and discuss results of

– Reporting – Sharing Extensions – other information	the work done. Realisation mode: Video conferencing – shared screen modality- discussion also held by messages posted on chat Individual presentations take place in the final event.

Distinction between activities that all students can be engaged at, and activities that differentiate in their implementation or totally, between students with physical and on-line participation.		**Common Activity X**

Common Activity X

Description of the STEAME activity that can be executed by all students. Both those present in the physical space as well as those participating on-line.

- SIL organization – plenary online meeting
- Activity 1: Brainstorming – motivation phase and video material presentation and analysis
- Activity 6 - plenary session: letter writing (collaborative writing)
- Activity 8 – simultaneous sculpture building (at home and in the tech lab)

Individual Activity Y.1	**Physical Groups Y.2**
Description of the STEAME activity that can be executed by students working independently. - Activity 2 –fieldwork – students take photos of installations and complete worksheet - Activity 5 - self-assessment - Activity 7 – model project design	*Description of the STEAME activity that can be executed by students present in the physical space.* - Activity 9 – students prepare a written report/ leaflet about their model sculpture

Online Groups Y.3	**Blended Groups Y.4**
Description of the STEAME activity that can be executed by students participating through an on-line environment. - Activity 3 – students collaborate in writing activity through communication sharing platform - Activity 9 – students make a short multimedia presentation of the model sculpture (video or PPt)	*Description of the STEAME activity that can be executed by students participating through a mixed physical and online environment.* - Activity 4 – creation of the virtual tour on Google Maps- My maps – - Activity 7 – model project design – finalization and teacher guidance - Activity 8 – collaborative sculpture building: students from home 'guide' the students in the tech lab while building the model - Activity 10: presentation of the model sculptures at a public event

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HYBRID STEAME LEARNING & CREATIVITY PLAN (L&C PLAN): Market analysis

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This L&C Plan may be implemented:

	Physical Presence		Hybrid		On-line		Flip Classroom		In All Cases
								■	

1. Overview	
Title Driving question or Topic	Market analysis Entrepreneurship and Mathematics related in a non-obvious way.
Ages, Grades, … Duration, Timeline, Activities	<table><tr><td>Ages: 15-19</td><td>_8-12_____ grades</td><td>_4__ learning hours (+4 individual work at home)</td></tr><tr><td>_4_ * 60 minutes</td><td colspan="2">_7___ activities</td></tr></table>
Curriculum Alignment Contributors, Partners Abstract - Synopsis	There is a variety of enterprises, often closely located selling the same products, for example groceries, pharmacies, gas stations. The purpose of the project is to map their locations and monitor their prices over some period of time. In this description in order to stick to a concrete we will speak about pharmacies but it should be understood that they can be replaced by any other places selling comparable goods or providing services. There are obvious entrepreneurship aspects in the project as well as mathematical aspects related to the Travelling Salesman Problem and Voronoi diagrams.
2. STEAME framework	
Teachers' cooperation STEAME in Life (SiL) Organisation Action Plan Formulation	Teacher 1: Mathematics Teacher 2: Entrepreneurship The purpose of the plan is to increase awareness of people how prices of various goods arise, what are the basics of the logistics and to realize that, as usual, there is a lot of mathematics behind. STAGE 1 Preparation of the project. Explaining the goals to the students in class and connected remotely. STAGE 2 Development of the project. The out-of-the-class students carry

	out field survey, their in-class mates get data, analyze it, direct out-of-the-class students to their next destinations. STAGE 3 Summary of the project. Learning its theoretical backgrounds.

3. Objectives and methodologies

Learning goals and objectives	Students become aware of logistic issues including choice of locations of points selling specific goods or supplying specific services.
Learning outcomes and expected results	They learn the ability to work with a map, to plan and optimize routes. They discover the complexity of organizing the society and ways to meet its need. They are capable of noticing shortages in supply of specific goods in specific regions and can identify opportunities. They discover mathematical modelling behind route planning and included simplifications.
Prior knowledge and prerequisites	The students have working command of basic geometric objects as segments and triangles, understand the relations between geometric objects and some of algebraic expressions naturally assigned to them.
Motivation, methodology, strategies, scaffolds	Trading is one of human activities developed at the very beginning of mankind. Nowadays it is no more only about maximizing profits. Modern society needs to be met efficiently, so that the society can focus on its productivity, creativity and human development. Widely understood logistics is a complex process, which involves various fields of mathematics. One of them is optimization is briefly touched upon in this plan. The plan is flexible enough to allow teachers to adapt to situations at hand. For example, flipped classroom approach can be used bot in practical part: finding pharmacies in the neighborhood and document the findings. This task can be then analyzed and discussed online in a hybrid way. The students will discover that there are various strategies to visit certain points on the map. They will learn to argument for choosing their particular strategy (or realize that there was no argument) and work out optimal solutions. Another possible approach is to get familiar with the strategy theory and try to apply it in the praxis.

4. Preparation and means

	Physical Presence	On-line or at distance
Preparation, space, setting Troubleshooting tips Resources, tools, material, attachments, equipment	At the beginning a specific type of selling points or service points need to be identified. There should be at least 4-5 such points accessible for out-of-the-class students. The selection is determined while all students are connected. The students must have access to a map which they can annotate easily. It can be either a printed map or an	At the beginning a specific type of selling points or service points need to be identified. There should be at least 4-5 such points accessible for out-of-the-class students. The selection is determined while all students are connected. The out-of-the-class students must be equipped with smartphones and have good enough internet access. They should be able to be mobile in

		editable map in an application.	their close proximity. If mobility is excluded, eg. For legal reasons, they need access to online maps and possibility to perform phone questionnaires.
		They also need a spreadsheet to enter and analyze data. Ideally they work on a file located in the cloud so that they have access to the date also from outside the school.	
	Safety and health		The external students must watch out for traffic safety and selection of people interviewed for their surveys.

Cloud tools/platforms	Common	
	Cloud tools/platforms used to implement the learning and creativity plan e.g.: 1. Editable map creator, e.g. MyMaps by Google https://www.google.com/maps/about/mymaps/ 2. Editable online spreadsheet, e.g. Sheets by Google *https://www.google.com/sheets/about/* 3. Communication platform (depending on what is used for distant and/or hybrid learning at the particular school) with chat and video access	
	Physical Presence	**On-line or at distance**
	4. Printed map of the area where experiments take place	5. A device to document the work progress, e.g. camera to show the actually visited place. 6. An app measuring actually covered distance, e.g. step counter. 7. An app measuring time used to cover certain legs of the planned route.

	5. Hybrid learning scenarios (tick the box-es)
	using a camera to show the presentation
	using share screen to show a presentation
	onsite students sit in front of their screen and adapt to the online students
X	*there are 2 cameras: one showing what the students are doing and reacting and one showing the teacher*
	do a hands-on activity digitally and adapt to the online environment
	the hands of a student onsite become the hands of the student online
X	*using platforms that implement experiments digitally*
	having activities that have 2 activities to be done at the same time
X	*other*

	6. Implementation	
Instructional activities,		The project has twofold motivations. First, it is related to the well-known in

procedures, reflections Assessment – Evaluation Presentation – Reporting – Sharing Extensions – other information	mathematics and computer sciences Travelling Salesman Problem: given certain points on a map optimize travel between them. Optimization usually concerns distance but it can also concern time The second motivation comes from the economics. It concerns basics of logistics: location of sale (or service) points and calculating prices. The mathematics behind the location problem is related to Voronoi Diagrams, again a well-known concept in mathematics and computer sciences. In this description we assume that the sale points of interest are pharmacies but they can be easily replaced by groceries, bakeries, gas stations etc. It is important that in the proximity of students there are at least 4-5 such points otherwise the outcome of the project is disturbed by too few data collected. The project begins by the presentation of the project goals by teachers (this can be done also in a flipped class approach) and group formulation (this requires presence or good online asynchronous preparation by teachers). This part takes ca. 1 teaching hour. The student might need 1 more hour to study presented concepts on their own at home. The core of the project are visits of the field groups to local pharmacies and collecting twofold data. The data of the first kind concerns travelled distances and taken time. The second set of data concerns prices of some basic goods (which have to be agreed on in the preparatory part) e.g. aspirin, sore throat pills, nasal spray etc. These data should be then compared between various places. If possible the field groups could also run short surveys in the pharmacies on where they take their goods from (which wholesalers) and they ask people in the street where they buy their basic medicine and why. Students communicate with students in class, whose task is to collect all data and analyze it with applications available in the cloud. These activities should take 2 teaching hours but time can be adopted if local conditions speak for other solutions. Before the final stage of the project students prepare presentations and/or reports on their activities. They reflect on their experiences and formulate conclusions. (It is possible to run the same project with the same students in the future in order to check if their understanding and achievements have improved). This work at home could take ca. 2 teaching hours. In the final stage students present their findings. Teachers explain theoretical backgrounds of the project and illustrate similar large scale projects. They can invite commerce or business representatives to add additional perspective to the subject of the project. Activities specific to external students are marked with E, e.g., A2E, those specific to in-class students are marked by C, e.g., A2C. STAGE 1 Preparation of the project. A1. Teachers explain the goals of the project to students in class and to those connected remotely. Groups are formed. A2E. Forming groups and discussing task division among group members. A2C. Forming groups and discussing task division among group members. A3E. Preparations within task groups. A3C. Preparations within task groups.

	STAGE 2 Development of the project. A4E. Out-of-the-class student groups set out to their first destination. They collect data and carry out surveys if they are a part of the project. A4C. In-class mates students get first data sets and analyze them. They direct out-of-the-class students to their next destinations. Steps A4E and A4C are repeated necessary number of times. A5E. All out-of-the-class students meet online and discuss their experiences. A5C. All in-class students discuss in the class they way of collecting data and directing field groups. They report on the communication issues and reflect on adopted strategies. STAGE 3 Summary of the project. A6EC. Students present their findings in form of a compact presentation and/or report. A7. Teachers explain theoretical backgrounds of the project from the perspectives of the entrepreneurship and mathematics.

Distinction between activities that all students can be engaged at, and activities that differentiate in their implementation or totally, between students with physical and on-line participation.	**Common Activity X**
	A1. Teachers explain the goals of the project to students in class and to those connected remotely. Groups are formed. A7. Teachers explain theoretical backgrounds of the project from the perspectives of the entrepreneurship and mathematics.

	Individual Activity Y.1	**Physical Groups Y.2**
	Students perform additional research on their own or watch some suggested videos, e.g.: https://www.youtube.com/watch?v=1pmBjIZ20pE	A2C. Forming groups and discussing task division among group members. A3C. Preparations within task groups. A4C. In-class mates students get first data sets and analyze them. They direct out-of-the-class students to their next destinations. Activity A4C is repeated as many time as necessary. A5C. All in-class students discuss in the class they way of collecting data and directing field groups. They report on the communication issues and reflect on adopted strategies.
	Online Groups Y.3	**Blended Groups Y.4**
	In this project the out-of-class students are considered rather as external than online because the project requires in the first line their activity in the field. If this is	A6EC. Students present their findings in form of a compact presentation and/or report.

	not possible for some reason then, and only then, the project can be done with online students at their homes. A2E. Forming groups and discussing task division among group members. A3E. Preparations within task groups. A4E. Out-of-the-class student groups set out to their first destination. They collect data and carry out surveys if they are a part of the project. A5E. All out-of-the-class students meet online and discuss their experiences.	

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HYBRID LEARNING & CREATIVITY PLAN (L&C PLAN): Can the Earth feed us? (developed from the guide *Supporting Mathematics and Science Teachers in addressing Diversity and promoting fundamental Values – MaSDiV*)

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This L&C Plan may be implemented:

	Physical Presence		Hybrid		On-line		Flip Classroom		In All Cases
								■	

1. Overview	
Title Driving question or Topic Ages, Grades, … Duration, Timeline, Activities	**Can the Earth feed us?** How to feed 9 billion people?

Ages: 12-14	6-8 grades	3 learning hours
3 * 60 minutes	8 activities	

Curriculum Alignment Contributors, Partners	Science, entrepreneurship
Abstract – Synopsis	*During the first 60-minute lesson, the class is divided into groups, and students investigate the most important information about environmental impacts of food production and present the results of their investigation.* *During the second 60-minute lesson, students will analyze the menu of their school and develop a healthy menu for their school. The last 60-minute lesson is devoted to the design, creation and presentation of the menus.*
References, acknowledgements	https://www.youtube.com/watch?v=NgLFJTzH1JI https://awellfedworld.org/food-insecurity-climate-change https://ourworldindata.org/environmental-impacts-of-food https://feeding9billion.com/F9B-Videos-Equitable-Diets.htm https://wordwall.net/resource/16211109/food-groups https://feeding9billion.com/F9B-The-Card-Game.htm

2. STEAME framework	
Teachers' cooperation STEAME in Life (SiL) Organisation Action Plan Formulation	*First teacher – Biology/ Sciences* *Second teacher – Entrepreneurship* *An online event to present a healthy menu and to sell other healthy menus for other schools or for family use.* *Stage 1: Preparation by 2 teachers.* *Stage 2: Action Plan Formulation. The 2 teachers collaborate to the creation of 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.

3. Objectives and methodologies	
Learning goals and objectives	*Students will have to:* *- list the causes of hunger* *- analyze the environmental impacts of food production* *- make up a healthy menu, that does not harm the planet*
Learning outcomes and expected results	*The project aims to raise awareness about the environmental impact of food production and the necessity of feeding the Earth population without harming the planet.*
Prior knowledge and prerequisites	*Basic knowledge of data analysis.*
Motivation, methodology, strategies, scaffolds	*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, discussions.* *As they explore this learning plan, students build critical thinking, communication skills and creativity.*

4. Preparation and means		
	Physical Presence	**On-line or at distance**
Preparation, space, setting Troubleshooting tips Resources, tools, material, attachments, equipment Safety and health	*Tablets and laptops in order to find out the required information and one laptop for each group to communicate with their colleagues who are online. According to lesson activities, students can work in groups or individually and, sometimes, in plenary session. Telephones, tablets or cameras to take photos or make movies.* *Equipment will be secured with appropriate antivirus.*	*Tablets and laptops in order to find out the required information. Telephones, tablets or cameras to take photos or film.* *Activities will take place online or at distance according to health rules.*

Cloud tools/platforms	**Common**	

	Cloud tools/platforms used to implement the learning and creativity plan e.g.:
	   1. *Whiteboard.fi*
	   2. *Google classroom/ Zoom/ Skype*	

	Physical Presence	**On-line or at distance**
	1. *Whiteboard.fi* 2. *…*	3. *Whiteboard.fi* 4. *Google Classroom/ Zoom/ Skype*

5. Hybrid learning scenarios (tick the box-es)	
	using a camera to show the presentation

V	using share screen to show a presentation
	on-site students sit in front of their screen and adapt to the online students
V	there are 2 cameras: one showing what the students are doing and reacting and one showing the teacher
	do a hands-on activity digitally and adapt to the online environment
	the hands of a student onsite become the hands of the student online
	using platforms that implement experiments digitally
	having activities that have 2 activities to be done at the same time
	Other

6. Implementation	
Instructional activities, procedures, reflections	*The plan can be completed in 3 learning hours.* *Step 1* **1. Activity 1 – Brainstorming** *The teacher asks students to imagine that 2 teams receive as many apples as needed for each team member and the other 2 teams receive only 1 apple each. They will have to divide the apples equally among the group members. Then he will ask them how they feel and what they think. What do they think of the quantity of apples each team received? How was the division to be made? Does this happen with the food supplies all around the world? What do they know about it?* *A video about food shortage around the world will be shown –* https://www.youtube.com/watch?v=NgLFJTzH1JI *(World Hunger Day). Students will watch it and then share their impressions. Then the teacher will ask them* **what causes hunger** *and a* **clustering** *will be drawn.* **2. Activity 2 – Data search and Processing of collected data** *The teacher divides the class into groups. Each group will have to read and analyze information about:* - *the link between hunger and climate change (*https://awellfedworld.org/food-insecurity-climate-change*);* - *environmental impacts of food production (*https://ourworldindata.org/environmental-impacts-of-food*).* *Students will present the results of their work to the whole class. They will try to answer to an important concluding question:* **How to feed 7 billion people in a way that doesn't harm the planet?** *After the students proposed their solutions, they can watch a video that will help them understand more about this particular topic:* https://feeding9billion.com/F9B-Videos-Equitable-Diets.htm **3. Activity 3 – Presentation of results.** *Students will present the results of their work to the whole class. They will try to answer to an important concluding question:* **How to feed 7 billion people in a way that doesn't harm the planet?** *After the students proposed their solutions, they can watch a video that will help them understand more about this particular topic:* https://feeding9billion.com/F9B-Videos-Equitable-Diets.htm **4. Activity 4 – Data search and Processing of collected data** *Students, in groups/break-out rooms, will receive a link about the 5 food groups (*https://wordwall.net/resource/16211109/food-groups*)* **(Annex 1)** *and based on this information they will* **analyze their school's menu and the menus of several other schools and explain why this menu/those menus**

	is/are suitable or is not/are not suitable for the recommendations in the previous video and in the picture.
	Students will put together a healthy weekly menu for their school/family, accompanied by explanations and pictures. They will take care that this menu will not harm the planet.
	5. ***Activity 5 – Analysis of the result obtained.***
	6. ***Activity 6 – Conclusion.***
	7. ***Activity 7 – Role play debate.***
	Students will take on a role in the local governing body. Issues up for debate are, for example, more vegetarian food in the Towns schools or mandatory vegetarian canteens for environmental reasons.
	8. ***Activity 8 – The card game about food security***
	Students will play a special game through which they will fix the concepts of food security. All the materials are free and can be downloaded here: https://feeding9billion.com/F9B-The-Card-Game.htm ***(Annex 2)****. This game can be played into the classroom, so all the materials will be printed, or can be played online, using **Whiteboard.fi,** in such a way that the players will display their cards on the virtual board.*
Assessment – Evaluation Presentation – Reporting – Sharing Extensions – other information	*The feedback and evaluation are continuous throughout the actions until the presentation of the results.* *At first, the presentation of the results will be done into the class, then an online event to present a healthy menu and to sell other healthy menus for other schools or for family use can be organised.*

Distinction between activities that all students can be engaged at, and activities that differentiate in their implementation or totally, between students with physical and on-line participation.	**Common Activity X**	
	Description of the STEAME activity that can be executed by all students. Both those present in the physical space as well as those participating on-line.	
	Individual Activity Y.1	**Physical Groups Y.2**
	Online Groups Y.3	**Blended Groups Y.4**
		All the enumerated activities can be implemented through blended/hybrid groups.

STEAME 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 (STEAME 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 mathematics or other 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 Actions and Cooperation in Creative Projects for school students
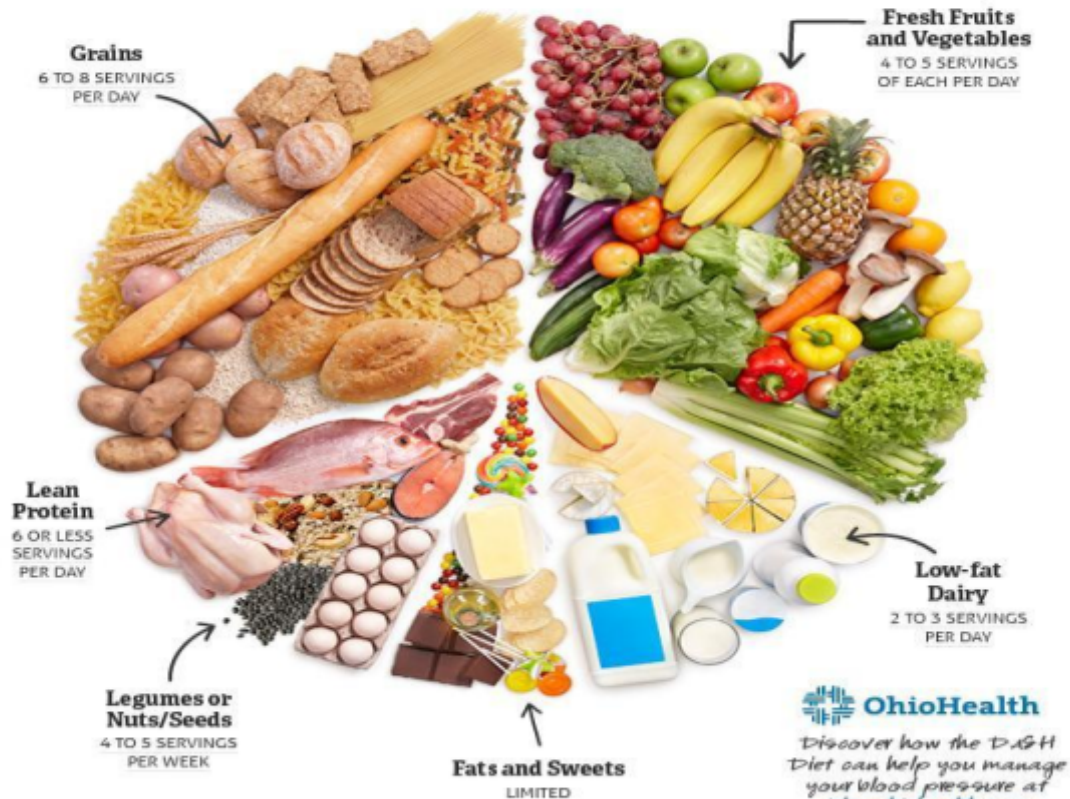
Title of STEAME Project: _____

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

Annex 1

The DASH Diet for Healthy Blood Pressure

Follow these DASH (Dietary Approaches to Stop Hypertension) guidelines for a healthier, more balanced diet

Grains
6 TO 8 SERVINGS PER DAY

Fresh Fruits and Vegetables
4 TO 5 SERVINGS OF EACH PER DAY

Lean Protein
6 OR LESS SERVINGS PER DAY

Low-fat Dairy
2 TO 3 SERVINGS PER DAY

Legumes or Nuts/Seeds
4 TO 5 SERVINGS PER WEEK

Fats and Sweets
LIMITED

OhioHealth

Discover how the DASH Diet can help you manage your blood pressure at blog.ohiohealth.com