

## LEARNING & CREATIVITY PLAN (L&C PLAN):

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### 1. Overview

Title	A glass of hot chocolate!!!
Driving Question or Topic	Which glass should I choose for hot chocolate? What is the most advantageous option? What should be the selling price of a glass of hot chocolate at the bazaar in order to make a satisfactory profit?
Ages, Grades, ...	Age selection 13-15, Grades 7-9
Duration, Timeline, Activities	16 X 45 min <span style="float: right;">Timeline/frame, calendar 4</span>
Curriculum Alignment	Physics (heat), Mathematics (Geometry, Measurement, Statistics, Algebra)
Contributors, Partners	
Abstract - Synopsis	<i>The students organize a charity bazaar in which they will sell, among other things, a hot chocolate drink. They explore what kind of material they should choose for the glass in which they will serve the hot chocolate, in order to keep the temperature as long as possible and at the same time, this option is advantageous, in order to give them the most income. In the selected glass, a picture related to the theme of the action will be printed, which will be designed by the students. Students will have to come up with the most advantageous option, taking into account all the costs of purchasing the materials for making the chocolate, the glasses and printing the picture on them. The ultimate goal is to make a decision regarding the selling price of a glass of hot chocolate, which is within the market price range and at the same time brings them a satisfactory profit.</i>
References, Acknowledgements	

### 2. STEAME Framework\*

Teachers' Cooperation	<ul style="list-style-type: none"> <li>• Teacher 1 (T1-Mathematics)</li> <li>• Teacher 2 (T2-Physics)</li> <li>• Teacher 3 (T3-Art)</li> <li>• Teacher 4 (T4- Economics)</li> <li>• Teacher 5 (T5-Computer Science)</li> </ul>
STEAME in Life (SiL) Organization	
Action Plan Formulation	Reference to the Stages and the Steps of the STEAME Framework (Action Plan Formulation)

\* under development the final elements of the framework

### 3. Objectives and Methodologies

<b>Learning Goals and Objectives</b>	<ol style="list-style-type: none"> <li>1. <i>To plan and perform a valid and fair experiment to investigate their hypotheses</i></li> <li>2. <i>To distinguish the variables that affect the temperature change of an object</i></li> <li>3. <i>Collect and record data using various methods, such as observation, measurement / recording</i></li> <li>4. <i>Construct frequency tables and graphs with the data they collect and interpret data tables and graphs</i></li> <li>5. <i>Apply the reduction method to the unit to calculate the unit price of objects</i></li> <li>6. <i>To formulate arguments, which explain based on the data.</i></li> <li>7. <i>To make conjectures according to the conditions that prevail each time and carry out control procedures</i></li> <li>8. <i>Develop the ability to make effective decisions.</i></li> </ol>
<b>Learning Outcomes and expected Results</b>	<ol style="list-style-type: none"> <li>1. <i>To draw and paint the outer surface in the appropriate glass and to construct it in a design program on the computer with an appropriate scale</i></li> <li>2. <i>Make a poster for the counter of their drinks</i></li> <li>3. <i>Make a price list of hot chocolate (or other drinks) for different sizes of glasses</i></li> <li>4. <i>To make an advertising spot (video) for the drinks they serve with reference to the advantages of the glasses they use and their advantageous prices</i></li> </ol>
<b>Prior Knowledge and Prerequisites</b>	<ol style="list-style-type: none"> <li>1. <i>Graph construction (frequency polygons, bar graph) with ordered pairs</i></li> <li>2. <i>Proportions</i></li> <li>3. <i>Volume / capacity of solids (glass shape / truncated cone)</i></li> <li>4. <i>Surface area</i></li> <li>5. <i>Skills of using temperature measuring instruments</i></li> </ol>
<b>Motivation, Methodology, Strategies, Scaffolds</b>	<p><i>Inquiry based learning approach, collaborative learning, teamwork.</i></p>

## 4. Preparation and Means

Preparation, Space  
Setting, Troubleshooting  
Tips

*Procedures, spaces, and material preparation  
Setting in classroom, outdoor activity, computer lab etc*

Resources, Tools,  
Material, Attachments,  
Equipment

*Supermarket and coffee shop websites for collecting information on selling prices of beverages, raw materials and serving glasses of hot drinks, glasses of various materials, thermometers, timer, square millimeter paper, painting materials, excel software, camera*

*Safety and Health*

*Attention in the Physics laboratory with the handling of hot water containers*

## 5. Implementation

Instructional Activities,  
Procedures, Reflections

**Activity 1: Group-collaborative activity (groups of 4-5 students)(Worksheet 1)**

• Brainstorm:

The thematic context is presented to the students and each student in the group is asked to write down in a worksheet all the elements that he/she thinks they should study, so that the sale of hot chocolate in the charity bazaar brings them a satisfactory profit. The students of each group discuss and come up with a list of elements-variables that they should study, which they present in plenary, justifying their choices. After discussion and argumentation, all students come up with a common list of items to deal with later.

**Activity 2: Group-collaborative activity (groups of 4-5 students) (Worksheet 2)**

• *Selection of suitable glass material-conducting an experiment to determine which material keeps the water hot for a longer period of time.*

Students have at their disposal six glasses of different materials (aluminum, glass, porcelain, paper, plastic and polystyrene). All glasses have the same plastic cap, in which there is a suitable hole for inserting a thermometer in the glass.

Each group of students will use two glasses of different materials to investigate which of them keeps the water hot longer. A specific amount of water at a temperature of 50 °C will be placed in the glasses.

Students make assumptions about which glass they think will keep the water warm for longer. They then measure the temperature of the water in each of the two glasses at regular intervals of one minute and record it on a double-entry board . Then they make the corresponding graph.

The data collected by all the groups is recorded in an excel spreadsheet, where the students make a graph of the water temperature in the glasses as a function of time. Students interpret the multiple graph and draw conclusions about the temperature maintenance time in each different glass .

**Activity 3: Group-collaborative activity (groups of 4-5 students)**

• **Milk and chocolate powder market research.**

Students search the supermarket websites for the prices of fresh milk and chocolate powder, in order to choose the most advantageous packages. They apply the method of reduction to the unit, in order to calculate the price of the unit in each package.

They record the information they collect in tables (Worksheet 3) and come to conclusions regarding the most advantageous purchase of raw material for the manufacture of hot chocolate drink.

• **Survey for information on the selling prices of hot chocolate or other hot drinks from cafes that have a resident distribution of drinks.**

Students search the cafeteria websites that offer resident beverage distribution for hot chocolate selling prices to determine the price range and determine the selling price of their own hot chocolate. Record the information they collect in a table (Worksheet 3). (Information can also be collected on other beverages, such as tea).

**Activity 4:**

• **Balance sheet.**

The students, after taking into account all the data they have studied and the conclusions they had reached in the previous activities, do a market research on the packaging of the glasses they will buy (number of glasses in the package in relation to the price of the package) and costs printing the designs on them. Taking into account all the data related to costs and the suitability of the glass in terms of maintaining the temperature, they end up with the selling price of hot chocolate for two or three different sizes of glasses.

**Activity 5:**

• **Painting.**

Each student is asked to measure the dimensions of the selected glass (the glass from the selected material can have different sizes) and to calculate the area of the side surface, in order to draw on the computer the side surface with the correct dimensions. The shape will be printed and then the students will create a drawing related to the theme of the action, where the most popular ones will be printed on the glasses for use in the charity bazaar.

To select the drawings to be printed, students will photograph their drawings and submit them in google form, so that the students of the school can make their choice.

**Activity 6:**

• **Advertising campaign-more sales**

Students make a poster for their beverage counter, a hot chocolate (or other beverage) price list for different glass sizes, and a promotional video for the beverages they serve with reference to the benefits of the glasses they use and their bargains.

Assessment - Evaluation

*Formative assessment throughout students work.*

Presentation - Reporting  
- Sharing

*Presentation of the action to the students and teachers of the school.  
Presentation through the commercial, in the school bazaar.*

Extensions - Other  
Information

**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