

LEARNING & CREATIVITY PLAN (L&C PLAN): ROAD SAFETY

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1. Overview

Title	Road safety
Driving Question or Topic	<i>How to reduce road accidents and casualties?</i>
Ages, Grades, ...	16 – 18 K-11
Duration, Timeline, Activities	25 learning hours 25x45minutes 6
Curriculum Alignment	Physics of collisions, Statistical Data Processing, Car Safety Systems, Poster Creation, Video Creation
Contributors, Partners	
Abstract - Synopsis	<i>The students are involved in a multifaceted investigation of the issue of road safety. They are concerned about a social phenomenon and try to act as active citizens and utilize scientific knowledge to suggest ways to alleviate the problem of road accidents.</i>
References, Acknowledgements	

2. STEAME Framework*

Teachers' Cooperation	<ul style="list-style-type: none"> • <i>Teacher 1 (T1) - Teacher of Physics</i> <i>Formulation of the topic, bibliography study, teaching of the Physics of collisions, coordination of groups.</i> <i>Physics Laboratory.</i> • <i>Teacher 2 (T2) - Teacher of Mathematics, Statistics, Research Methodology</i> <i>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.</i> <i>Classroom.</i> • <i>Teacher 3 (T3) - Art teacher.</i> <i>Poster design guidance.</i> • <i>Teacher 4 (T4) – Teatrology teacher</i> <i>Guidance on creating a video clip script for road safety.</i> • <i>Teacher 5 (T5) - Teacher of Economics</i> <i>Teaching the costing process of a service (creating specifications, market research, creating a budget for the service).</i> • <i>Teacher 6 (T6) - Teacher of Computer Science</i> <i>Teaching the construction of electronic questionnaires (e.g. Google Forms) or data entry (in Excel Spreadsheet or other Data analysis software).</i> <i>Teaching methods of statistical analysis and graphical presentation of results (using Excel).</i> <i>Support for converting the poster to electronic format and creating the video clip.</i> <i>Computer Lab .</i>
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STEAME in Life (SiL) Organization	<i>Road safety is an issue that all people face in their daily lives. In their investigation, the students will deal with data that they will collect themselves and data that they will receive from competent bodies (eg Police). They will try to raise public awareness of road safety issues by creating posters and videos.</i>
Action Plan Formulation	<p><i>STAGE I: Preparation by T1 and T2 [STEPS 1-3], and</i></p> <p><i>STAGE II: Formulation of an Action Plan [Preparation of STEPS 1-2]</i></p> <p><i>Refers to the creation of this learning plan, by teachers in collaboration.</i></p> <p><i>STAGE II: Formulation of an Action Plan [Implementation of STEPS 3-11]...</i></p> <p><i>Refers to the realization by the students of the activities of the Learning Plan.</i></p> <p><i>The support, feedback and evaluation by the teachers is present during the implementation of the activities and not only the final result.</i></p> <p><i>STAGE II: Formulation of an Action Plan [Implementation of STEPS 3-11]...</i></p> <p><i>Refers to the realization by the students of the activities of the Learning Plan.</i></p> <p><i>STAGE II: Formulation of results by students and guidance by teachers (STEPS 12-14). Intermediate control by teachers and feedback to students (STEP 15)</i></p> <p><i>STAGE II: Repeat steps 5 - 11, if necessary, draw final conclusions and communicate them (STEPS 16 - 18).</i></p>

3. Objectives and Methodologies

Learning Goals and Objectives	<ol style="list-style-type: none"> <i>To plan and carry out experimental activities for investigation: <ul style="list-style-type: none"> <i>the role of the seat belt in a car</i> <i>the role of the airbag in a car</i> <i>the dependence of the braking distance of a car on its speed</i> </i> <i>Collect and record data using various methods, such as observation, measurement / recording</i> <i>To process statistical data and correlate variables.</i> <i>Understand the role of the active citizen.</i>
Learning Outcomes and expected Results	<ol style="list-style-type: none"> <i>Experimental data on the force exerted on a body during impact on a surface and in an airbag as a function of the velocity of the body during impact.</i> <i>Experimental data for the vehicle braking distance as a function of vehicle speed before braking.</i> <i>Experiment video on the role of the seat belt in a car.</i> <i>Questionnaire to investigate the views of a specific population on road safety issues.</i> <i>Poster for raising community awareness on road safety issues.</i> <i>Video clips to raise community awareness on road safety issues.</i> <i>Economic study on the cost of a measure to improve road safety (eg installation of cameras in traffic lights).</i>
Prior Knowledge and Prerequisites	<ol style="list-style-type: none"> <i>Basic knowledge of descriptive statistics and use of spreadsheets (excel).</i> <i>Knowledge of using motion and power sensors</i> <i>Basic knowledge of design program in computer.</i>
Motivation, Methodology, Strategies, Scaffolds	<p><i>Inquiry based learning approach, working in groups with collaborative learning.</i></p> <p><i>The surveys given by the teachers are open and the students are invited to design the ways of conducting these surveys. Teachers intervene when students have difficulty planning investigations or have not considered all aspects of the problem</i></p>

4. Preparation and Means

Preparation, Space
Setting, Troubleshooting
Tips

The teaching of the basic concepts of Physics of collisions and statistical analysis will be implemented by T1 and T2 in the classroom. Experimental investigations are carried out in the Physics laboratory. The electronic questionnaire design can be done either in the computer lab under the guidance of the T6, or in non-school time with the support of the T6. Communication with agencies that can provide information on road safety can be done through the school unit.

Resources, Tools,
Material, Attachments,
Equipment

- *For the role of Physics in road safety and for exploration ideas*
 - <https://www.scienceinschool.org/content/look-out-physics-road-safety>
 - <https://www.mynrma.com.au/-/media/documents/motoring-education/study-guides/nrma-the-road-safety-total-learning-resource-years-9-10.pdf?la=en>
 - <https://www.sci-ed-ga.org/staying-alive>
 - <https://roadsafety.scot/wp-content/uploads/2017/08/Neale-Kinnear-Changing-speed-limits-Implications-for-road-safety.pdf>
 - <https://www.youi.com.au/youi-news/road-safety-week-the-physics-of-speeding>
 - <https://learn.teachingchannel.com/video/8th-grade-science-motion>
 - <http://www.fisme.science.uu.nl/toepassing/28754/>
 - *Data collection methods - Sampling methods and techniques - Construction and use of appropriate questionnaires (paper or electronic) - Methods of checking the validity and reliability of the questionnaire (use of appropriate software) - Methods of statistical analysis and presentation of results - use of results (use of appropriate results) detailed research report*
- Links to the Learning and Creativity Plan of the STEAME program “Research–Services Evaluation”*
- *Physics laboratory with cars, motion and force sensors.*
 - *Computers with video design and editing programs*
 - *Collection of information on the number of road collisions and their characteristics*
 - *Traffic departments of the Police or the municipality*

Safety and Health

5. Implementation

Instructional Activities,
Procedures, Reflections

The L&C plan can be implemented in 25 periods. In the 1st period, T1 and T2 discuss with the department and through an ideological storm record the aspects of road safety that need to be investigated. T1 and T2 guide the class, if necessary, indicating factors not mentioned. Then the actions that the groups will deal with are divided, with some actions, directly related to the syllabus being common to all groups. The course of the group work, the collaboration with the other teachers, the way of receiving feedback and the method of evaluating the work of each group are determined. Students are invited to study the material at the links mentioned above for road safety.

1. The Physics of Impacts (4 periods)

T1 teaches the Physics of collisions and instructs teams to design and perform experimental activities to explore the following:

- *The force exerted when a body hits a hard surface (car dashboard) and a soft one (airbag).*
- *What will happen to a car passenger in a road collision, if he/she has not put on a seat belt.*

• How the braking speed of a vehicle changes relative to the vehicle speed before braking. How does this distance depend on the condition of the road.
Each group undertakes to investigate one of the above factors and presents to the plenary the results of the investigation.

2. Collection, statistical processing of data and their presentation. (6 periods)

T2 and T6 help students to collect data on the views of a certain group of people (eg schoolchildren) about the causes of road accidents and how to reduce them and, at the same time, to obtain data from the competent authorities on road collisions and their causes.

3. Design a poster to raise public awareness about road safety. (3 periods)

T3 guides teams in theme selection and poster design. Each group can deal with a different issue of road safety (eg use of seat belt, observance of the speed limit, avoidance of driving under the influence of alcohol, non-use of mobile phone while driving, etc.)

4. Costing of a measure to improve road safety. (3 periods)

With the help of the T4, the teams undertake to cost the implementation of a measure, which will improve road safety (eg installation of cameras at road junctions, continuous surveillance of motorways to exceed the speed limit, withdrawal of cars without airbags, etc. a.).

5. Creating a script for video clips for road safety (4 periods)

T5 guides teams to create a common road safety video clip. Each group can contribute material from the actions they have already carried out.

6. Presentation of results - Preparation of a detailed research report (4 periods)

Each group prepares a presentation with the results of the actions it has implemented. The groups turn to the teachers for help, depending on the action. T1 – T6 provide ongoing support, feedback and evaluation.

Assessment - Evaluation

The feedback and evaluation is continuous throughout the actions until the presentation of the results.

Presentation - Reporting
- Sharing

The presentation of the results can be done for the student community of the school, but findings from the research of the groups can be communicated to competent bodies of the community (e.g., Municipal Council, Police, etc.).

Extensions - Other
Information

The work of the class can be the beginning of a more general effort to raise the awareness of the entire student population and the community on road safety issues in collaboration with relevant bodies.

STEAME Prototype/Guide for Learning & Creativity Approach
Action Plan Formulation - Steps provided by Kypriaki Mathimatiki Etaireia

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