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# The Educational Scenarios from the PAFSE Project

EUROPEAN TRAFFIC EDUCATION SEMINAR 2024

Tuesday 17 September

Online | 09:45 – 15:15 CEST

Alain Areal  
Prevenção Rodoviária Portuguesa  
[www.prp.pt](http://www.prp.pt)

**PAFSE: Partnerships for Science Education**

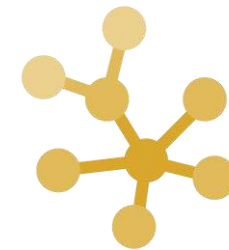
Project approved under Horizon 2020: Science with and for Society  
Call: H2020-SwafS-2018-2020  
Topic: Open schooling and collaboration on science education

# PAFSE MAIN GOALS

- **Create regional health education clusters of schools based on partnerships between universities, research centers, museums, civil society organizations, and industry with the involvement of the local community.**
- **Enhance the levels of scientific literacy and prepare community to address public health challenges**
- **Increase students' interest in STEM disciplines and health-related professions**
- **Engage students in project-based learning and inquiry based learning.**
- **Provide an inclusive educational environment supported by a web platform for collaboration and dissemination of the teaching-learning experiences and educational resources**
- **To guarantee the sustainability and the continuation of open schooling approaches to health education and community preparedness beyond the period of initial funding.**
- **To have impact on the student's interests, competencies, and choices related to science curricula and careers.**



# Educational Scenario Structure



- **Context**
- **Scientific content and its relevance to public health education**
- **Subject**
- **Target** (Science classes Grade)
- **Estimated duration**
- **Classroom organization requirements**
- **Glossary** (general; scientific; pedagogical)
- **Indicative literature**
- Competences/Learning Goals/outcomes** (Knowledge, Beliefs, Skills, Attitudes/ Behaviour)

**Assessment methods:** Formative and summative

**Content** (relevant to learning goals & research topics)

**Digital Learning Objects (DLO)**

**Digital Educational Resources (DER)**

**Supplementary Learning Resources and Educational Activities**

**Teaching-Learning Activities (5/6 sessions)**

**School Research Project**

**Open School Event**

## 5 E's Model



## Educational Scenario/Science Approach

**Open Schooling**



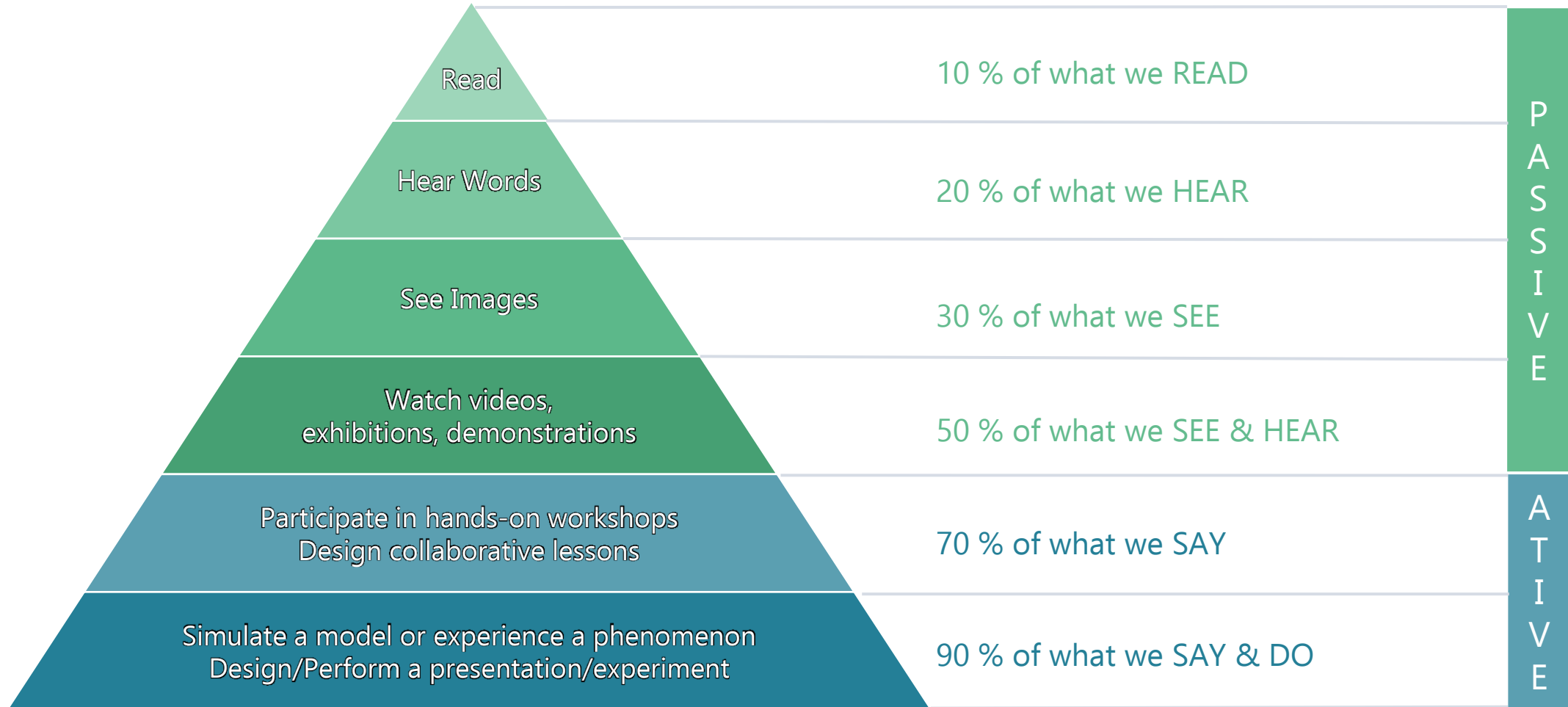
**Open-source digital  
resources**

**Inquiry Based Learning**

**Project Based Learning**

# Edgar Dale's Cone of Experience:

2 weeks later, we tend to remember:



Edgar Dale (1969)



# Educational scenarios

## Sustainable Mobility

- Sustainable mobility
- Environmental protection and social and economic dimension
- EcoMobility
- Quality of life and road safety
- **School Research Project - Mobility patterns – Survey**
- **Open School event**

## Road traffic crash risk factors

- A public health problem
- Speed
- Safety equipment
- Distraction, Fatigue
- DUI
- **School Research Project – Opinions, attitudes, behaviours – Survey**
- **Open School event**

## Road traffic crashes, a public health issue

- Concept of public health, road traffic crashes as a major issue
- Road safety indicators based on road crash statistics, international and national level
- Risk behaviours in traffic
- **School Research Project – Roadside observations**
- **Open School event**

## EDUCATIONAL SCENARIO

- **Teaching - Learning Activities**
- **Science Classes Curriculum**
- **9th grade** (+/- 15 years old students)
- **6 sessions of 40-45 minutes**
- Science teachers integrate other colleagues in the enactment of the scenario (e.g., physics, chemistry, ICT, mathematics, citizenship and English teachers), as it aims to be interdisciplinary.



**Lesson 1: Road crashes, a Public Health Problem**

**Lesson 2: Speed**

**Lesson 3: Speed**

**Lesson 4: Safety Equipment**

**Lesson 5: Distraction and Fatigue**

**Lesson 6: DUI - Driving Under the Influence  
(Alcohol)**

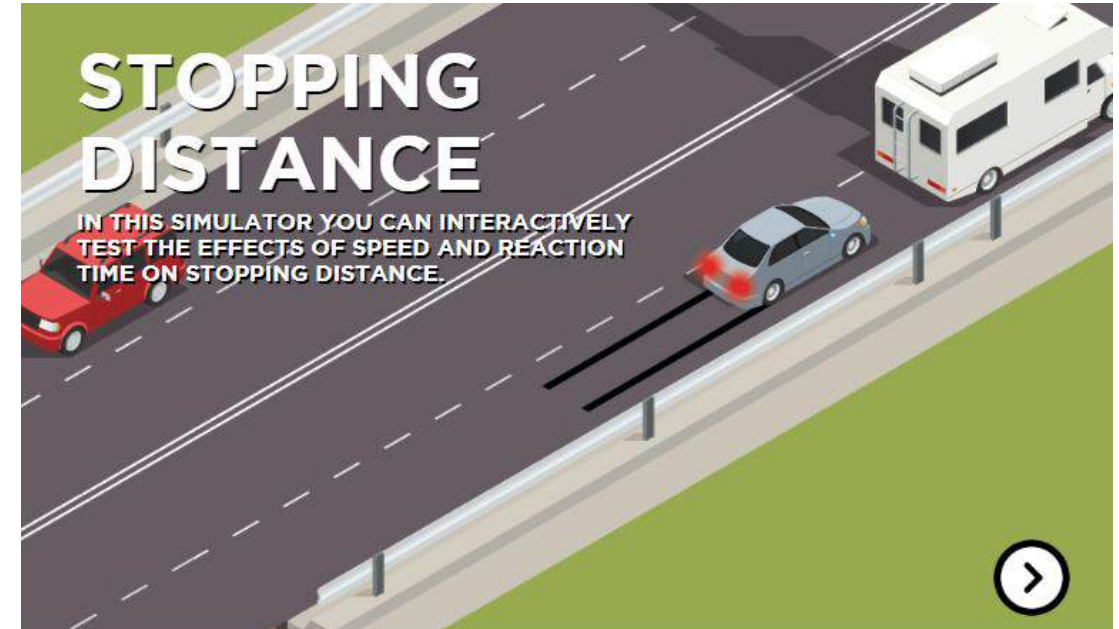
## Lesson 2: Speed

- The teacher launches the question: “*Which tasks does a person perform whilst walking, riding or driving?*”
- After debate the teacher presents an image **New DER 5 - Task performance in traffic (infographic)** showing and explaining which tasks a person performs whilst walking, riding or driving (Collect information; Anticipation, Decision, Action) and how the road traffic risk factors previously identified influence task performance. Students understand that all tasks are interdependent and when one is affected, the performance of the following one is also influenced (e.g., if we are distracted by the mobile phone, we miss important information that comes from road environment, we will predict and decide with lack of information, which will in turn increase the likelihood of errors and inadequate decisions, also increasing reaction time to stimulus and thus the risk of a road crash).



## Lesson 2: Speed

- Teacher presents the **New DLO 1 - Stopping distance (simulator)**. The simulator allows teacher/students to distinguish, explore and calculate stop distances = (reaction time/distance + breaking distance) at different speeds with different reaction times, different levels of friction (dry, rain, snow) and different distances to an obstacle. The simulator calculates speed at the time of collision and demonstrates the consequences if the driver was not using a seat belt.
- Teacher launches the following question to the same groups: ***What happens when a vehicle is moving, the driver sees an obstacle and needs to break?***
- Each student of each group is invited to explore the simulator and makes different simulations using different variables (reaction time, speed, pavement) and take notes of the results. Then among them they compare and discuss the different simulations results and the impact of variables in stop distances, reaction time/distance and breaking distance.



## Lesson 2: Speed

Each group will present their own conclusions and the teacher, supported by the simulator, should reinforce the following concepts:

- The higher the speed the breaking and stopping distance are also much longer
- Small differences in speed can lead to a road crash or run-over since the breaking and stop distance increases.
- The greater the friction, the shorter the braking and stopping distance
- When reaction time increases the reaction distance and stop distance increase as well which can lead to an increase of the risk of accident.
- Safety distance is the distance that allows a driver to stop the vehicle on a free space in front of him, avoiding any collision.



## Lesson 3: Speed

The students are organized in groups with the purpose of exploring the **New DLO 3 – Impact speed on a Run-over (Simulator)** using different speeds and distances and fill the following table. Students will be asked to analyse the relationship between speed, collision speed and pedestrian probability of death in a run-over situation.

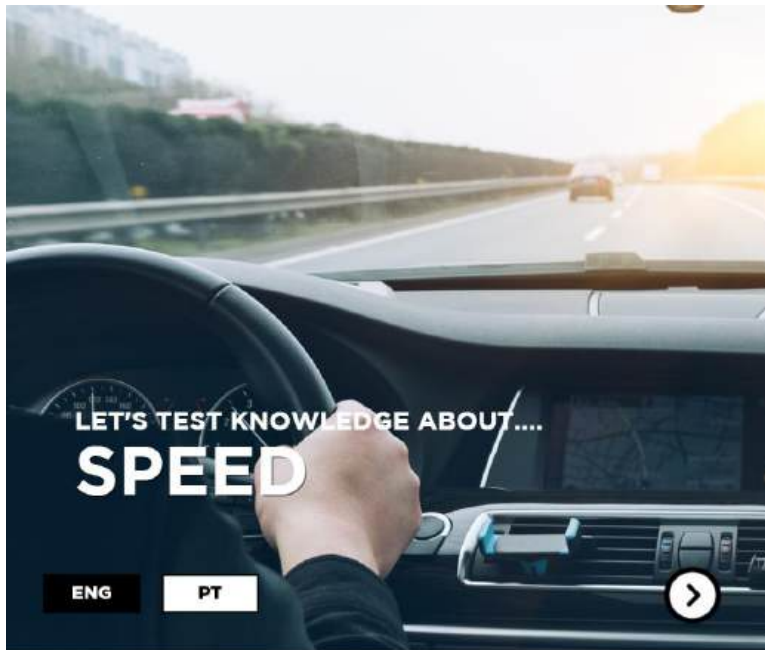
- After simulations, students discuss results, reach conclusions and share with other groups the simulation's results.
- The teacher launches the debate through the following conclusions:
- The collision severity as a direct relationship with speed. In a high-speed impact, the risk of injury and death is much higher.
- The human body has shock resistance limits and after impact at a certain speed a person does not survive.
- Small excesses of speed in urban areas have major consequences for pedestrians, increasing the probability of death and injury.



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N.º 101006468

Developed by:

To consolidate knowledge and deconstruct myths and beliefs associated to speed, students will be invited to answer the quiz **New DLO 4 - Speed (Quiz)** Example: The use of a mobile phone during driving task doesn't have an impact on reaction time; The speed limit should decrease if the probability of a conflict with vulnerable users (pedestrians, cyclists, etc.) increases.



Question 1 of 10
Question 1 of 10

THE HIGHER THE SPEED, THE GREATER THE AMOUNT OF INFORMATION, AND LESS TIME TO PROCESS IT.

THE HIGHER THE SPEED, THE GREATER THE AMOUNT OF INFORMATION, AND LESS TIME TO PROCESS IT.

TRUE

FALSE

**CONTEXT:**  
The more information the brain receives, the more difficult it becomes to process and analyze all the data (the presence of motorcycles, pedestrians, etc.). The faster we circulate, the less time we have to observe, analyze and make an appropriate decision.

[LEARN MORE](#)

TRUE

FALSE

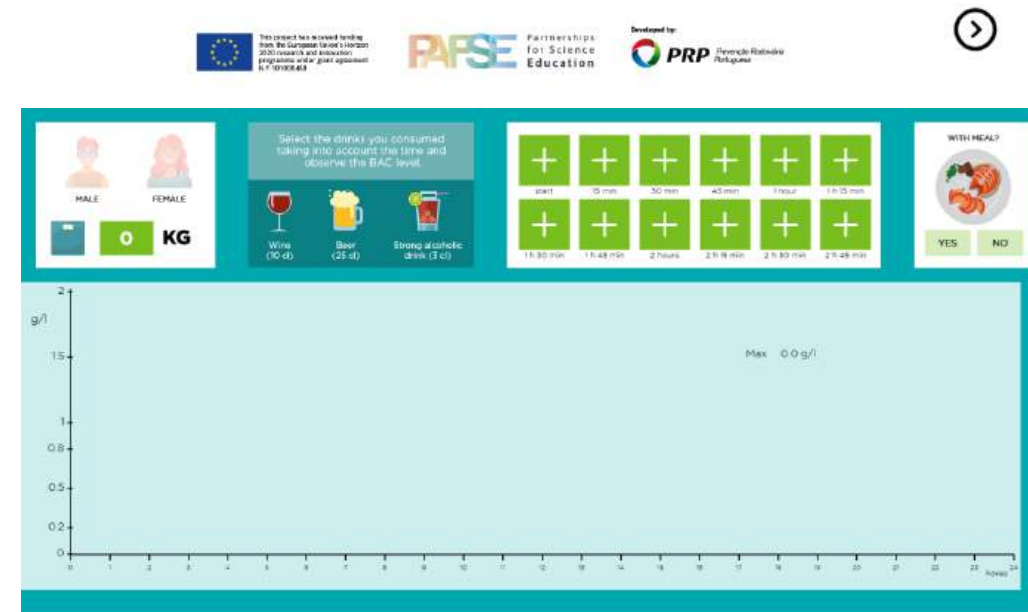
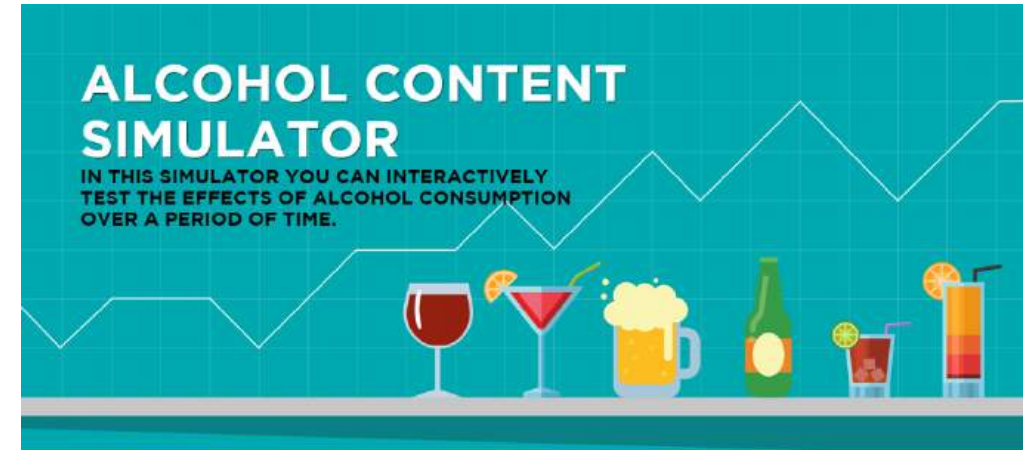
## Lesson 6: DUI - Driving under the influence (Alcohol)

Teacher launches to the classroom the following questions:

- *What is the presence of alcohol in the body?*
- *How can bac level be calculated?*

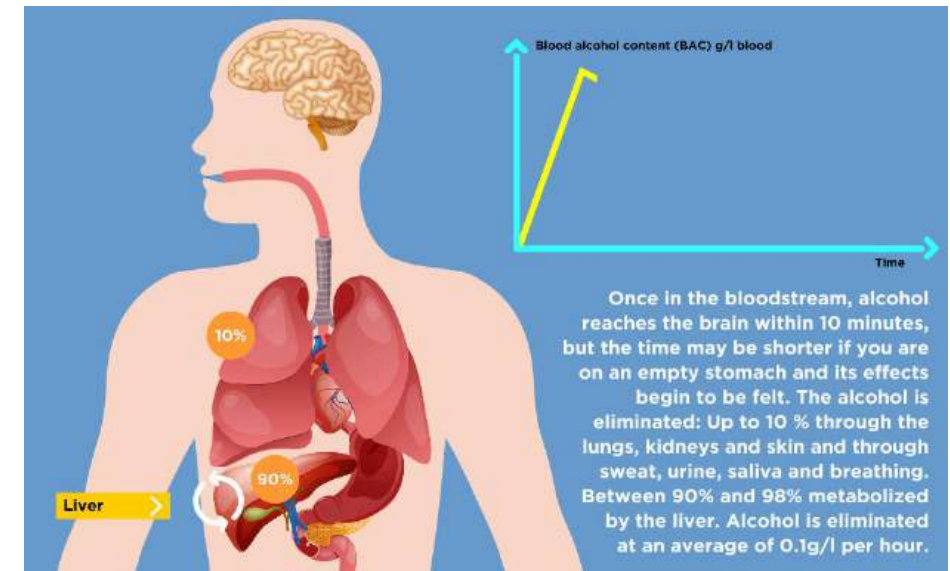
After debate teacher and students must conclude the presence of alcohol in the body is calculated through the blood alcohol concentration (B.A.C.) that is usually expressed in grams of alcohol per litre of blood (g/l). The quantification of the level of alcohol in the blood is carried out by a test on the expired air, carried out in a quantitative analyzer or by blood analysis. A Breathalyzer is an instrument intended to measure the mass concentration of alcohol per unit volume in expired alveolar air.

Teacher invites students to explore the **New DLO 8 - BAC (simulator)**. The BAC simulator allows to calculate BAC levels by doing simulations with different types and amounts of beverages and using different variables that influence alcohol absorption and elimination in the human body such as gender, weight, meal. The simulator will be developed based on the 'Widmark formula'. The Widmark formula provides only an approximate indicator of the TAS (ERSO, 2006).



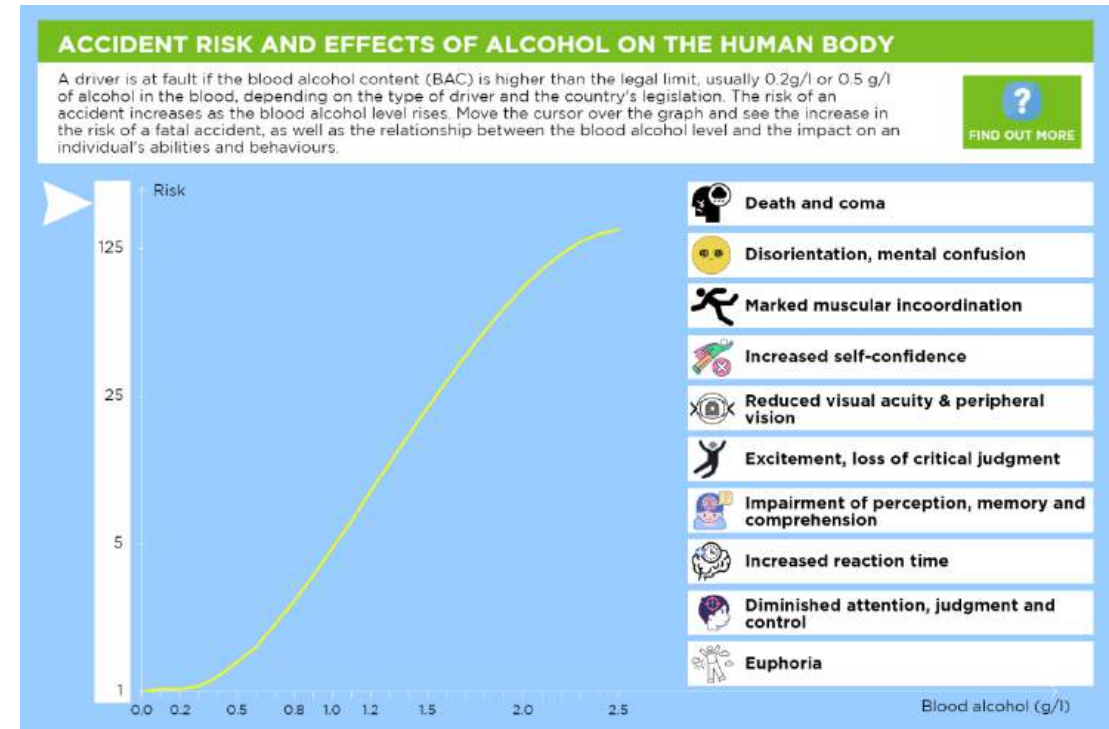
The teacher divides the class into groups.

- Some groups will be invited to answer the questions “How alcohol is absorbed by the human body? What factors influence the rate of absorption of alcohol?”
- Others groups will be invited to answer the questions “How alcohol is eliminated by the human body?” What factors influence the rate of elimination of alcohol? Can we intervene in the alcohol elimination process?”
- After debating these topics, the teacher with the support of **New DER 12 - Alcohol absorption and elimination (infographic)** consolidates the following concepts:
- how alcohol is absorbed by the mucous membranes of the mouth and oesophagus, the stomach and large intestine and by the proximal portion of the small intestine - absorption takes between 15-20 minutes, and there are factors that can change the speed of absorption;
- how alcohol is eliminated through sweat, urine, saliva and breath. The rest (90% to 98%) is metabolized by the liver to acetaldehyde.
- The liver metabolizes concentrated ethanol in the blood at an average of 0.1g/l per hour. It's a very slow process. Some studies show that women have lower amounts of the enzyme alcohol dehydrogenase (ALDH) than men (Pedrosa, 2013).

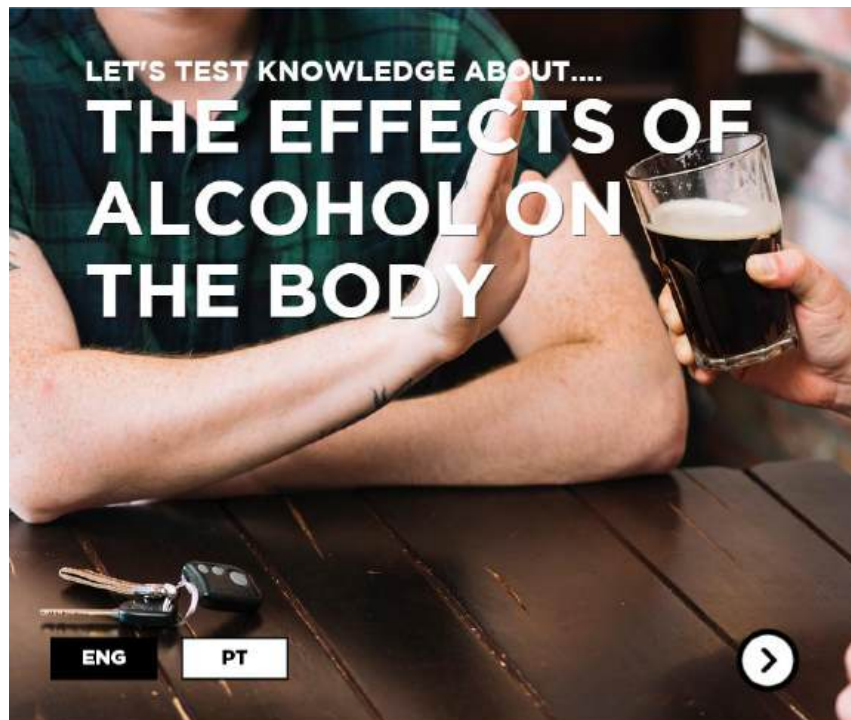


Teacher invites students to explore the **New DLO 9 - Risk of accident and effects of alcohol on the human body (infographic)**

- They should conclude that risk of accident increases with the increase of BAC level.
- Teacher together with students makes the relationship with task performance phases:
- Collect information: decreased psycho-sensory abilities; poor collection of information; stimulus detection.
- Anticipation: difficulty in data processing.
- Decision: difficulties in deciding what to do; bad decisions.
- Action: longer reaction time; incoordination and suddenness of movements, disturbance of psychomotor abilities.



To consolidate knowledge and deconstruct myths and beliefs associated to alcohol, students will be invited carry out a quiz **New DLO 10 - Alcohol - Myths and Beliefs (Quiz)**. Example: Food lessens the effects of alcohol; There are substances that accelerate the elimination of alcohol



Question 1 of 10

THE EFFECTS OF ALCOHOL DEPEND ON THE AMOUNT OF ALCOHOL INGESTED. THE HIGHER THE BAC, THE MORE SEVERE THE EFFECTS ON DRIVING.

TRUE FALSE

Question 1 of 10

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TRUE FALSE

**CONTEXT:**  
 Alcohol impairs the ability to drive by influencing the driving tasks:  
 Perception: decreased psycho-sensory abilities, poor collection of information, detection of stimuli;  
 Prediction: difficulty in data processing;  
 Decision: difficulties in deciding what to do and wrong decisions;  
 Action: longer reaction time, incoordination, and suddenness of movements disturbance of psychomotor abilities.

LEARN MORE

## School Research Project

Students will be invited to explore and identify what are the phases of a research process. They will present and debate their findings and teacher will compare student's contributions with the **New DLO 11 - Step-by-step questionnaire on road accident risk factors (power BI)** which includes all the information needed for the different phases of the project development:

- the steps of building a survey.
- definitions and examples of population, sample, sample size, and associated margin of error.
- examples of surveys: online forms (if possible, online forms should be used – e.g.: Google Forms, Microsoft Forms, ...).
- a survey based on a crash risk factor (helmet) using a spreadsheet (Microsoft excel, Google sheets, or other) and explains the functions needed for calculating performance indicators based on survey data collected (percentage of cyclists who do not wear the helmet while cycling);
- discuss the limitations of scientific evidence obtained with the survey.

### Roadside observation survey

Step-by-step information for carrying out the study:

- behaviours to observe and instructions for observations;
- planning and instruments for data collection;
- datasets and calculation formulas;
- examples for presenting the results.

#### Roadside observation survey

**What is a roadside observation survey?**

This type of research aims to study the risk behaviours of road users in a given location – it could be a neighbourhood, a city or a country. In this study, the researcher observes behaviours in the road environment, records the observed data and calculates indicators that allow to quantify the level of the risk behaviours.

For example, to know the percentage of cyclists who ride without helmet, the researcher observes the cyclists with and without helmet who ride in a given location and calculates the percentage: number of cyclists without helmets / total number of cyclists \* 100.

**Steps**

In this type of research, the steps of the scientific method normally used in scientific research are followed:

- Step 1 - Define a purpose/question
- Step 2 - Perform background research
- Step 3 - Establish hypotheses
- Step 4 - Run an experiment (gather data)
- Step 5 - Analyse the interpret the data
- Step 6 - Draw conclusions
- Step 7 - Share the results

**More information**

This document provides information on how to carry out a roadside observational survey, from the definition of possible research questions, the behaviours to observe, how to build databases and how to present the results.

Click on the images below to explore possible studies on the behaviour of pedestrians, cyclists, motorcyclists/moped riders and car drivers/passengers.

Developed by: PRP

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# SCENARIO RISK FACTORS OF ROAD CRASHES

## LEARNING OBJECTS



**DIVIDED ATTENTION GAME**

## INSTRUCTIONS

### IMPACT SPEED ON A RUN OVER

IN THIS SIMULATOR IT IS POSSIBLE TO INTERACTIVELY TEST THE EFFECTS OF SPEED, REACTION TIME AND THE DISTANCE TO THE PEDESTRIAN ON THE IMPACT FORCE OF A COLLISION.



### IMPACT FORCE

IN THIS SIMULATOR IT IS POSSIBLE TO INTERACTIVELY TEST THE EFFECTS OF SPEED AND WEIGHT ON THE IMPACT FORCE OF A COLLISION.




### FIELD OF VIEW

IN THIS SIMULATOR YOU CAN INTERACTIVELY TEST THE EFFECTS OF SPEED ON THE FIELD OF VIEW.



### STOPPING DISTANCE

IN THIS SIMULATOR YOU CAN INTERACTIVELY TEST THE EFFECTS OF SPEED AND REACTION TIME ON STOPPING DISTANCE.



### LET'S TEST KNOWLEDGE ABOUT... SPEED

QUIZ



### LET'S TEST KNOWLEDGE ABOUT... RISKY BEHAVIOURS IN TRAFFIC

QUIZ



### DISTRACTION

READ AND ANALYZE EACH SENTENCE REGARDING THE DISTRACTION. SELECT AND DRAG EACH SENTENCE TO THE CORRESPONDING FIELD.

DRAG & DROP



SIMULATOR

SIMULATOR

SIMULATOR

SIMULATOR

QUIZ

QUIZ

DRAG & DROP

### ALCOHOL CONTENT SIMULATOR

IN THIS SIMULATOR YOU CAN INTERACTIVELY TEST THE EFFECTS OF ALCOHOL CONSUMPTION OVER A PERIOD OF TIME.



### ACCIDENT RISK AND EFFECTS OF ALCOHOL ON THE HUMAN BODY



### LET'S TEST KNOWLEDGE ABOUT... THE EFFECTS OF ALCOHOL ON THE BODY

QUIZ



### Roadside observation survey

Step-by-step information for carrying out the study:

- behaviours to observe and instructions for observations;
- planning and instruments for data collection;
- datasets and calculation formulas;
- examples for presenting the results.

Online app  
Presentation



### What is Public Health?

## Public Health and road safety

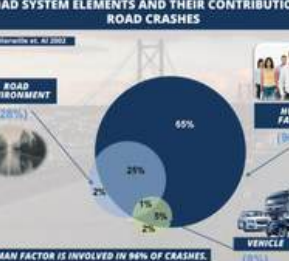


### CRAAP CHECKING TECHNIQUE



### ROAD SYSTEM ELEMENTS AND THEIR CONTRIBUTION TO ROAD CRASHES

THE HUMAN FACTOR IS INVOLVED IN 96% OF CRASHES.



### How is alcohol absorbed and eliminated by the human body?



SIMULATOR

SIMULATOR

QUIZ

PRESENTATION

PRESENTATION

ANIMATION

INFOGRAPHIC

ANIMATION

### HAZARD MATRIX

HAZARD MATRIX	Hours	Vehicle and Equipment	Road Environment
Before the crash	<ul style="list-style-type: none"> <li>Driver Training</li> <li>Road Safety Education</li> <li>Road Safety Campaigns</li> </ul>	<ul style="list-style-type: none"> <li>ABS System - Brake</li> <li>Electronic Stability System - ESC</li> <li>Advanced Emergency Braking - AEB</li> </ul>	<ul style="list-style-type: none"> <li>Non-slip Roadings</li> <li>Lighting</li> <li>Signaling</li> </ul>
During the crash	<ul style="list-style-type: none"> <li>Seatbelts</li> <li>Child Restraint Systems</li> <li>Strobe and knee pads</li> </ul>	<ul style="list-style-type: none"> <li>Seat belt pretensioners, airbags</li> <li>Crash sensors</li> <li>Complete series</li> </ul>	<ul style="list-style-type: none"> <li>Protection Beams</li> <li>Impact Energy Protection Systems</li> </ul>
After the crash	<ul style="list-style-type: none"> <li>First Aid Kits</li> </ul>	<ul style="list-style-type: none"> <li>Cell phones</li> <li>First Aid Kits</li> </ul>	<ul style="list-style-type: none"> <li>EMS stations</li> <li>Rescue Systems</li> </ul>




### What do we do while walking, driving or riding on the road?



### Field of View

Our field of view is on average 180°, and it's composed of:

- Central Vision - used to focus on details.
- Peripheral vision - used to collect information about the road environment.



### 3 TYPES OF COLLISIONS IN A CRASH ACCIDENT



### Collision time interval and pressure SAFETY EQUIPMENT



### TYPES OF DISTRACTION



### DRIVER FATIGUE



INFOGRAPHIC

INFOGRAPHIC

INFOGRAPHIC

INFOGRAPHIC

ANIMATION

INFOGRAPHIC

INFOGRAPHIC



# SCENARIO

# SUSTAINABLE MOBILITY

## LEARNING OBJECTS



QUIZ



BOOKLET



SIMULATOR



QUIZ



ANIMATION



QUESTIONNAIRE



DRAG & DROP



PRESENTATION



PLEDGE



PRESENTATION



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N.º 101006468



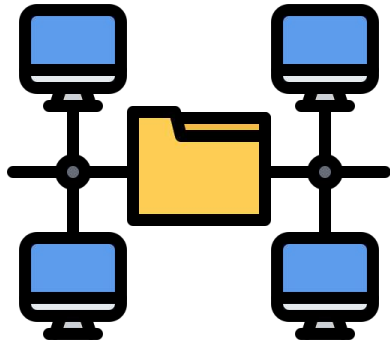
Partnerships for Science Education

Developed by:



Prevenção Rodoviária Portuguesa

# Educational Platforms



**e-me Digital Educational Platform**  
e-me4all.eu  
(European edition, for all)

[www.pafse.eu](http://www.pafse.eu)



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